VOLUME 31, NO. 3 • THE GEORGE WASHINGTON UNIVERSITY • EDITION 2, FALL 1984

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Established 1942

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CENTENNIAL MESSAGES

PRESIDENT LLOYD H. ELLIOTT 4
VICE-PRESIDENT RODERICK S. FRENCH 4
VICE-PRESIDENT WILLIAM P. SMITH, JR. 5
DEAN HAROLD LIEBOWITZ 5

ARTICLES

DAYS OF OLD BY BENJAMIN C. CRUICKSHANKS 6
INTERVIEW: MR. WILLIAM J. ELLENBERGER 8
THE MECHELECIV – HOW IT ALL BEGAN BY GEORGE PIDA 14
REFLECTIONS OF A WARM BODY BY MARJORIE R. TOWNSEND 16
RECOLLECTIONS OF TWO ALUMNI: JOHN MANNING & EDWARD WAREHAM 18
GW ENGINEERING – NOW & NEXT BY INGERESA PINCUS 23
THE VAULT FOR THE FUTURE BY MARY O. JONES 24

FEATURES

100 YEARS OF SEAS – AN ILLUSTRATED CHRONOLOGY 26

DEPARTMENTS

FROM THE EDITOR-IN-CHIEF 2
LETTERS TO THE EDITOR 3
FROM THE ENGINEER ALUMNI ASSOCIATION 28
FROM THE ENGINEERS' COUNCIL 29
CAMPUS NEWS 30

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FROM THE EDITOR-IN-CHIEF

Ever since its inception in 1942, MECHELECIV has reported on many different aspects of School and University life: interesting events and personalities; activities of the student body and the faculty; administrative changes and policy decisions; controversial issues and consensus opinions. For almost half a century, MECHELECIV has served as a major — sometimes the only — source of history and information about the School. In the absence of any other source of similar information, MECHELECIV over the years has acquired the role of "record keeper" of S.E.A.S. history.

It was appropriate, therefore, that MECHELECIV should continue this tradition of recording important junctures in the history of the School by devoting this issue to the centennial of S.E.A.S. Accordingly, we requested many prominent members of the School and University community to share the experiences of their association with S.E.A.S., their assessment of the progress made by the School and their thoughts about the challenges that S.E.A.S. must respond to, now and in the future. In doing so, we have tried to provide not only a historical perspective, but also to encourage discussion about the academic and technological challenges that will determine the future of S.E.A.S.

By including messages from the leadership of the School and the University, we endeavor to share with you their assessment of the past hundred years and their thoughts about the School's future. We also present a "personalized" historical perspective through the reminiscences and opinions of people representing many generations, who have witnessed and have been part of the evolution of this School during this century - from Professor Benjamin Cruickshanks, whose association with GW dates as far back as the First World War, to Ingeresa Pincus, who represents the new generation of independent and talented women in the technological world.

William Ellenberger, Marjorie Townsend, John Manning and Edward Wareham have provided a very interesting and informative account of the state of the School and its development, from the mid-twenties through the fifties. George Pida, who served as publisher for the first issue of MECHELECIV in 1942, provides us with a first hand account of the circumstances and the personalities that brought this magazine about. Marjorie Townsend (who was the Editor-in-Chief of MECHELECIV in the late Forties) and Ingeresa Pincus reflect some of the similarities and contrasts in the situation and perceptions of women in engineering, in the Forties and in the Eighties. Mary Jones presents a timely recollection of the events surrounding the establishment of the "Vault for the Future" and gives us a peek into its contents.

In the previous issue of MECHELECIV, I had extended an offer to the faculty and administration to use MECHELECIV "as a forum of communication and exchange of ideas." I am happy to inform you that due to the encouraging response from the faculty and student groups, we have introduced the "Campus News" department, to facilitate the inclusion of current news and events of interest to the School community.

MECHELECIV has come a long way since we revived it last year. In retrospect, I sometimes wonder whether I would have undertaken this endeavor if I had not grossly underestimated the effort involved, and if I did not have the help of the other members of the editorial board and staff of the magazine, who have contributed so much effort and time to ensure the success of MECHELECIV. But it has been a most gratifying experience and we feel great pride in the product we have created, and in the encouraging response it has received from our readership. I encourage students and alumni to join us in maintaining this tradition. MECHELECIV needs a new cadre of personnel to take over the management of the magazine next semester, when most of the current staff will be moving on — so dictates the reality of student life.

I hope you enjoy this issue as much as we have enjoyed bringing it to you. On behalf of the editorial board and staff of MECHELECIV, I wish you a very joyous holiday season and a happy new year.

Abid Kamran

Abid Kamran
Editor-in-Chief

Note: The previous issue was mailed to the students in early November — too late for students to participate in the Annual Engineering School Picnic that was publicized in the magazine for September 29th. The issue was mailed to alumni and faculty in mid-September, as planned. Unfortunately we were unable to get the mailing labels for students till much later. Hence the delay. We have subsequently, made arrangements with the Registrar's Office that, we hope, will avoid the recurrence of this situation.

LETTERS TO THE EDITOR

Dear Mr. Kamran:

Enclosed is the article in response to your request. I would not attempt to compare the past and present because I am not familiar with University life of the past 24 years. A few recollections of early years were thought might be of some reader interest, but you are free to publish, censor, or reject.

[Editor's Note: We appreciate professor Cruickshanks' prompt response to our request, at such short notice. His article appears on page 6]

The article in Spring 1984 issue, "The Dark Side of GW's Eng'g Education," if accurate of present conditions, is a reflection upon both faculty and administration.

Yours very truly,
Benj. C. Cruickshanks

Dear Mr. Kamran:

I am a 1949 graduate of the School of Engineering at the George Washington University and, in addition to earning a Bachelor of Civil Engineering degree at that time, I had earned the privilege of working on the staff of the MECHELECIV, having served for two years, as copy editor. I was also a member of the Engineer's Council which I now see is a publisher of the journal.

One point of coincidental interest. While I was at GW I met a young lady who was born and lived for a number of years at 2110 G Street, N.W. We have been married for 34 years. That home at 2110 G Street now houses one of the University's offices and is just several doors down from the Davis-Hodgkins House. If memory serves me correct, it was just about at that point that the Chairman of Civil Engineering had his offices and where the MECHELECIV offices were located as well.

At any rate, it's nice to see that the journal is back in business.

Aloha,
Jerrold M. Michael,
Sc.D., Dr. P.H.,P.E.
Dean and Professor
of Public Health
University of Hawaii at Manoa

LETTERS TO THE EDITOR POLICY: The opinions set forth in the "Letters to the Editor" page of this magazine are not necessarily the opinions of the staff of the MECHELECIV. This page is set aside each issue for use by students, alumni, faculty and staff of the School of Engineering and Applied Science. MECHELECIV will also accept letters from other sources if the letters concern the magazine or would be of interest to the School of Engineering community. MECHELECIV reserves the right to edit or omit any letter if lack of space deems it necessary, or if a letter appears to be unprintable in the opinion of the Editorial staff. All letters must be signed; however, pen names may be substituted if requested.

Congratulations, George Washington University, on the republication of MECHELECIV

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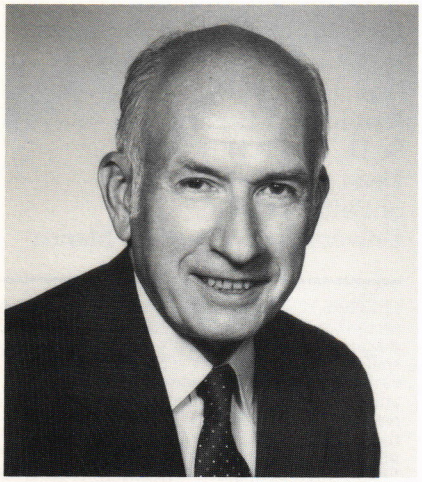
CENTENNIAL MESSAGES



Dear Members of
GW's Engineering Community:

The development of our engineering school — from its beginnings as The Corcoran Scientific School, with 126 students and no graduate program, to the School of Engineering and Applied Science as we know it today — gives the entire university community great cause for pride. The growth of engineering at GW has been possible because of your work and dedication. Your strength and stature as a School reflect most favorably on the parent University.

The manifold contributions of SEAS students, alumni, faculty members and administrators to advancements in industry and government, both nationally and internationally, deserve special recognition and hearty congratulations.

On behalf of The George Washington University, I am pleased to send greetings and best wishes on this historic occasion.

Sincerely,

Lloyd H. Elliott
President

The 100th anniversary of the School of Engineering and Applied Sciences provides an occasion for us to recall just how central your research and teaching is to the university and to society. Modern technology emerged in the Renaissance as the handmaiden of humanism in western culture. The entire world now shares this enthusiasm for technology as the instrument for the achievement of a quality of life beyond the level of ancient dreams and myths.

The roots of this nation and of technology lie particularly close together. They are to be found in the tradition of what may be called the central "methodology" of Western culture, namely, experimentalism. There is a solid line of conviction that runs from Francis Bacon through Thomas Jefferson to NASA. The American democracy is itself an experiment in applied intelligence. It is a sociopolitical extension of empiricisms's confidence that the human species indeed can learn from experience and thus modify its behavior in life-fulfilling ways.

This broad cultural history makes it more appropriate — even mandatory — for George Washington University to include a strong School of Engineering and Applied Sciences among its fundamental constituent units. The discharge of our full responsibilities as a comprehensive university in the capital of the world's most advanced society requires the presence of a strong engineering faculty whose research and teaching is focused on both theoretical and practical issues.

The work of the School of Engineering and Applied Sciences links directly with the academic work done in those schools and departments of the university that deal more explicitly with affairs of government and society. Precisely because advances in technology are profoundly consequential, not merely in the technical realm, but in their political and philosophical implications as well, it is indispensable that we have strong participation by engineers in debates regarding the *purposes* of human life as well as the *means* for their attainment.

The stakes are now very high because our scientists and engineers have done so well in discovering how to make nature serve human purposes. Only if all sectors of expertise in the university are parties to the dialogue by which those purposes are reviewed and reformulated from generation to generation can we be confident about the future of our civilization.

I congratulate the alumni, the students, the faculty and the leadership of the School of Engineering and Applied Sciences for the record made in its first century. I rejoice in the signs of increased excellence in all dimensions of the school. I look forward to your playing an enlarged role in the intellectual life of the university community.

Roderick S. French
Vice President for
Academic Affairs

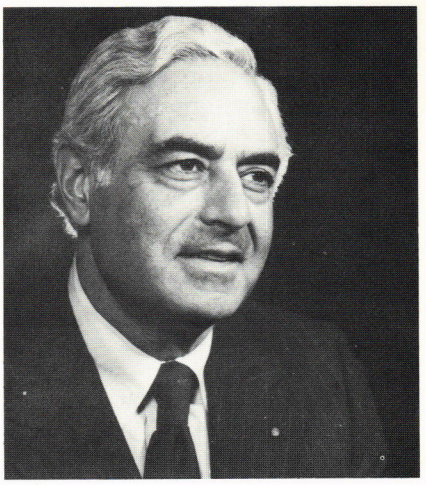
In 1943, a year after MECHELECIV was established, I attended my first class at GW. I had graduated in the spring from high school but had to wait until fall to enter the Army. In the meantime I took a government-sponsored course in radio communications given in the Engineering School's laboratory facilities, then deep in the basement of Samson Hall.

At that time in the history of the Engineering School and the University, the campus had few of today's major facilities. There was no Tompkins Hall of Engineering, no Gelman Library, Burns Library, Himmelfarb Library, Lerner Hall, Rome Hall, Rice Hall, Smith Hall, Smith Center, or Cloyd H. Marvin Center. Educational and research opportunities did not compare with today's. Whole fields such as Operations Research, Computer Science, pre-medical Engineering, and Engineering Administration lay in the future. The Cooperative Education Program in engineering had yet to be developed. Laboratory facilities and opportunities for student involvement in research were limited. Today's interdisciplinary research institutes did not exist. Students could not gain access to the stacks of the University library without a special permit.

This is my 29th year on the GW staff. It is for me the most exciting year of all, in view of the positive change and development taking place throughout the University. As opportunities for classroom study and laboratory research are enhanced, opportunities for intellectual activity to continue outside the classroom are expanding as well. The new MECHELECIV provides an excellent opportunity in S.E.A.S. to exchange ideas and share information. In future issues I hope to see in this publication increasing numbers of professional articles on research in the fields of Engineering.

The goal which has been set for the MECHELECIV, of developing it into a publication of exemplary service to the School is an objective which all members of the University can applaud. Congratulations to the Engineers' Council and the Engineer Alumni Association on returning the MECHELECIV to publication in this Centennial year of the School of Engineering and Applied Science!

William P. Smith, Jr.
Vice President for Student Affairs



October 1984 marked the Centennial Anniversary of the School of Engineering and Applied Science. In those one hundred years the engineering profession produced marvels which once seemed unbelievable. During this period SEAS was established, developed, strengthened and expanded. Its faculty and graduates were contributors to many of the technological oriented products which engineers researched, developed and manufactured. As the School grew, so did its reputation. Not only is it now looked upon as an excellent institution whose educational programs produce outstanding engineers at both the undergraduate and graduate levels but as a source of exceptional research activity in all of its departments. Also, the School's Continuing Engineering Education Program is considered the leader of many such programs in the United States.

The success of SEAS is attributable to a number of reasons but primarily to its students and faculty. It is their dedication, competence, motivation, zeal and hard work which has gained us the national and international reputation the School now enjoys.

We are looking forward to our second century with much optimism and anticipation. Last year in writing for MECHELECIV I mentioned not only our successes but three areas wherein I believed

we must exert concerted effort in the future for our School. These are: (1) raising the present high quality of our undergraduate, graduate and professional programs; (2) increasing our sponsored research and grants; and (3) modernizing and increasing our engineering facilities. In addition, it is important that we add faculty, particularly in new and important programs requiring high technological innovation. I am pleased to report that progress has been made in some of these areas. Initial indicators are that the SAT scores of our 1984 incoming freshman class exceed last year's class by 20 points in mathematics and 10 points in verbal. We have awarded twenty-two new Undergraduate Engineering Honor Scholarships this year - the highest number since the program was initiated in 1978. Twenty-four Graduate Engineering Honors Fellowships have been awarded over the past three years. In addition, new academic tracks have been instituted in several of our Departments.

Sponsored research projects have increased in the past year and we are planning to compete for new material and international programs. Our computer and laboratory facilities continue to grow with the award of a graphics oriented IBM 4341 computer system expected to be operational by the end of 1984.

We have made progress but we are not resting on our laurels. A new commitment by the students and faculty of SEAS is continuing which will help us surpass our past accomplishments. Our second century will begin on an elevated platform of excellence. I assure you that faculty and administrators are working diligently to make SEAS an institution that students and alumni will be more proud of and an institution that will serve you outstandingly now and into the future.

Harold Liebowitz
Dean, S.E.A.S.

DAYS OF OLD

Benjamin Carpenter Cruickshanks' affiliation with the George Washington University spans almost all of this century. One can get a better sense of the length of this time span from a column on Professor Cruickshanks in the December 1953 issue of MECHELECIV (see box, page 7). In 1953 he was being recognized as an institution at GW, having already spent over thirty years in service to this School and University, first as a student and from 1920 as a faculty member. Professor Cruickshanks has written for the MECHELECIV on a number of occasions. In November 1953 he wrote a lengthy and very informative article for MECHELECIV under the title of "Evolution of the Engineering Student". This centennial issue would not have been complete without recognizing his life-time of dedication to the School of Engineering and Applied Science.

By Benjamin C. Cruickshanks, B.M.E., 1920
Professor Emeritus of M.E., G.W.U.

Asked for a look at the past during my time at The George Washington University as first student and then instructor, it is difficult to pick out what would be of interest to the reader. A good place to begin perhaps is with my first visit to the University.

Upon graduation from high school I was given a diploma as "evidence of my graduation," and I supposed it would be necessary to exhibit it in order to register at the University. However, it had been glued to a cardboard base in framing and so could not be rolled. Rather, I decided not to take it on my first "exploratory" visit. The Dean personally took care of

registration in those days, and after a few minutes of conversation, during which I was momentarily expecting to be asked to produce the "evidence," he suddenly turned, picked up a blank form and said, "You go across the hall and fill out this application beginning, "I am a member of the Caucasian or White race," whichever you can spell," followed by what I found to be his usual humorous chuckle. This appeared to be a way of sizing me up, so after some thought, I spelled out Caucasian. That was registration. I imagine the process has changed over the years.

My schedule called for a class in Chemistry, so the Dean advised me that the Chemistry Department was in the Medical School Building, eight blocks away, and we had only ten minutes to make it. He said, "You can do it but you can't loaf."

A feature of University life of old, now missing is the Honor System. On every final or home examination the student was required to write out and sign the pledge, "I hereby certify that I have neither given nor received unauthorized aid in this examination." What led to its elimination I do not know, but something fine was lost to student life.

Two organizations that supplied much of the social life of the Engineering students seem to have dropped by the wayside. The professional fraternity, Theta Tau, and the honor fraternity, Sigma Tau, both limited to Engineering students, contributed greatly to student life. Their dances and annual banquets were always looked forward to. The gratuitous coaching classes of Sigma Tau were indeed unique, and were greatly appreciated by those helped.

In my first year on the faculty an interesting and unusual activity was started. Springtime arrived and a delegation of students called on me and announced that they had gotten permission from the Dean to have a School of Engineering baseball team, that they had already purchased uniforms (with "GW-ENG" on them), a schedule arranged, and asked me to be coach. The University already had a varsity team on which the students knew I had played the previous year. The caliber of the team was about that of a freshman team and the schedule included high school and suburban town teams. The team survived for about eight years, part of the time with Prof. Arthur F. Johnson as coach, and was finally swallowed up by the GW Intermural League.

Did one ever see a real steam engine on display in a classroom? As an instructor, the day our class in mechanisms was to start on the mechanism of the steam engine, I was on my way to class when I overtook a student member of the class. He was loaded down with a bulky object under his left arm, his left hand hanging over and carrying a briefcase. His right arm was hanging straight down and apparently carrying something heavy. I wasn't interested in his load, and besides it was getting dark, but as I overtook him I commented facetiously, "Looks like you are coming to class loaded." His surprising answer was, "It's for the class." It turned out to be the steam engine and steam boiler from an automobile. There were at least two steam-driven automobiles on the market at that time, the Stanley Steamer and the White Steamer. It was certainly a generous act to bring a load like that to class unsolicited.

The Engineers' Council's Annual Banquet and Dance of 1958 I shall never forget. MECHELECIV and the Council, noting my pending retirement, presented me with a Memory Book containing individual greetings from 154 former students. It was hard to believe.

MECHELECIV is a unique name and ought not to be changed. It is good to learn of its revival. This was a product of and about students in the School of Engineering. Without MECHELECIV, how else could my son, a student, have given me a dig?

This Centennial issue of MECHELECIV brings to mind the Engineers' Council Banquet celebrating the 50th Anniversary of the School of Engineering. It was surprising when the 75th was allowed to pass without a nod. I'm pleased to see the 100th being recognized.

The Engineering students led an active and enjoyable social life. I hope the lives of Engineering students today are as active and enjoyable as they were when I was a student here.

BENJAMIN CARPENTER CRUICKSHANKS

Out of the multitude of college professors a few emerge as legendary figures in the history of their schools. Professor Benjamin Cruickshanks can certainly qualify as one of George Washington's legendary personalities. With the exception of a four year period, Professor Cruickshanks has been teaching continuously at G.W.U. ever since he graduated from this university in 1920. His fame is more than local, however, as he is listed in "Who's Who in Engineering," "Who's Who in American Education," and in "Distinguished Leaders in the Nation's Capital." Although he is primarily a mechanical engineering instructor, all engineering students must pass through some of his classes.

Professor Cruickshanks has been very active in the American Society of Mechanical Engineers. In the Washington branch, he has held the offices of chairman, vice-chairman, and has been the delegate to the regional conference on several occasions. He has also been chairman of the Program Committee, Constitution and By-Laws Committee. At the present time he is Honorary Chairman of the student branch of the ASME here at The George Washington University. He has worked on the Region III Committee scheduling the annual student conference. Professor Cruickshanks is also associated with Sigma Tau, the engineering honorary society. For the past ten years he has been a member of the committee handling the award of the Sigma Tau Fellowship and for the past three years has been chairman of this committee.

Professor Cruickshanks graduated from The George Washington University with a B.S. in Mechanical Engineering in 1920. The first three years after graduation, Professor Cruickshanks spent his working hours as an instructor in Mechanical Engineering. In 1923 he left G. W. to become the editor of the Hartford Steam Boiler Inspection and Insurance Company publication *The Locomotive.* He remained in this post until 1927 when he returned to this university as an Assistant Professor of Mechanical Engineering. In 1923 he was advanced to the position of Associate Professor, and in 1942, to Professor. Since 1940 he has been the Executive Officer of the Mechanical Engineering Department here.

Professor Cruickshanks has also been active in fields other than engineering. He is a past President of the Manor Park Citizens' Association, a past Vice Chairman of the Committee on Suffrage for the District of Columbia, and past Vice Chairman of the Committee on City Planning and Parks. In addition, he has been active in the Public Health Advisory Council for the District of Columbia.

In the thirty years Professor Cruickshanks has spent at G. W., he has seen many students pass through his classes, and now, as he noted in his article in the November issue of the *Mechelociv,* he is seeing some of the sons of former students in his groups.

THE MECHELECIV

Reprinted from December 1953 issue of MECHELECIV.

INTERVIEW:

Mr. William J. Ellenberger

William J. Ellenberger joined the George Washington University in 1925. He received his Bachelor of Science in Electrical Engineering in 1934. His illustrious and diverse career started with the Potomac Electric Power Company (PEPCO) in 1932. His rich personality and wide range of interests are reflected in his career that took him on to the George Washington University, the National Bureau of Standards, and the United States Army. Mr. Ellenberger also served in the Second World War as an officer in the U.S. Army Signal Corps. Since 1968 he has chosen to be self-employed as an Engineer Consultant. His interests include Industrial Archaeology (he wrote an article for MECHELECIV in March 1969, on the subject) and the History of Engineering.

William Ellenberger has served the University as a student and as a loyal alumnus since 1925. He became a life member of the General Alumni Association (GAA) in 1931 and helped organize the Engineer Alumni Association (EAA) in 1936. His contributions to both the GAA and the EAA are too numerous to list here. Suffice it to say that over the years he has served in many positions of leadership in both organizations and has contributed an enormous amount of time in voluntary service to the University.

Over his long period of affiliation with the Engineering School, William Ellenberger has compiled an extremely interesting and very valuable record of his experiences as well as a historical record of the evolution of the Engineering School. In him, this School has perhaps its best - and probably only - historian. The conversation recorded here is an effort to record some of his experiences and reflections so that we and others after us may learn more about the history and evolution of the School of Engineering and Applied Science. Ed.

MECHELECIV: Mr. Ellenberger, you have been an engineer for 56 years. When did you decide to become an engineer?

Wm.E.: I can't recall any time in my youth when I didn't want to be an engineer and almost always an electrical engineer. That this was so is evident from my youthful interests:

I built structures and machines with my Meccano sets;

I recharged the home doorbell battery (zinc and salammoniac) before the use of the low voltage ac transformer;

I rigged up old Ford automobile ignition vibrator coils and experimented with them;

I built radio receivers, first with the galena crystal detector, later with vacuum tubes;

I watched the construction of underground conduit and manholes for telephone and power;

I watched excavation work by steam shovel and construction of buildings involving hoisting material by steam "donkey" engine.

MECHELECIV: What kind of high school training did you have which prepared you for engineering school?

Wm.E.: I took the manual training course at Central High School here in Washington, D.C. In addition to the usual academic subjects (English, American History, Latin and Spanish) I had four years of mathematics, physics, chemistry, mechanical drawing, wood pattern making, advanced wood working, automobile shop, metal-craft, etc.

MECHELECIV: Why did you decide to go to GWU and not some other engineering school?

Wm.E.: My family and I considered several schools. I could have gone to Ohio State University tuition free, because my parents were legal residents of Ohio--but the tuition benefit was offset by the cost of housing and travel. My father had graduated from Columbian University (now GWU) in Veterinary Medicine in 1897. I settled on GWU as a matter of economics--I could live at home, and tuition was low ($4.00/credit hour in 1925 as I recall). Car fare was cheap, and when attending day classes I almost invariably walked to the University from our home in Columbia heights. When I started at GWU in the fall of 1925 many of my high school classmates were there with me. Some of us have continuing friendships dating from 1921 when we entered high school.

MECHELECIV: What was GWU like when you entered in 1925?

Wm.E.: Primitive! The University consisted primarily of buildings in the block bounded by G, H, 20th

and 21st streets. The permanent university buildings were Corcoran Hall and Stockton Hall, and also old Lisner Hall at 2023 G street. Corcoran Hall had the largest classroom (Room 1) where all freshmen took Dean Wilber's English Rhetoric 1. The chemistry lecture and laboratory class rooms were on the two top floors of Corcoran Hall.

MECHELECIV: Where was the School of Engineering located then, and what were its facilities?

Wm.E.: The school was known by several names at various times: College of Engineering when I matriculated, later School of Engineering, and now SEAS. The administrative office was in a residence on 20th street. Classes were taught in available classrooms. Most of our classes were small, therefore we tended to use rooms in residence buildings acquired by the university. Classrooms peculiar to engineering subjects included: mechanical drawing and descriptive geometry, on the top floor of old Lisner Hall; electrical engineering labs, in the basement of Lisner; and strength of materials lab, steam engine lab, and internal combustion engine lab, all in the "barn" in back of the gymnasium (known as the "tin tabernacle"). The "barn" also housed a shiny automobile owned by Elmer Schatz, superintendentof buildings and grounds.

The story of how the barn was finally replaced is interesting. I cannot recall the date, but I believe Prof. Lapham was still the Dean. Our school was up for renewal of its accreditation. The visiting committee took a dim view of our physical facilities. As you will appreciate, a school can teach academic subjects in almost any kind of classroom and with a modicum of chemistry and physics laboratories and a good library can qualify to grant the AB degree. Not so, engineering. In those days the accrediting organization gave heavy emphasis to physical facilities. Schools such as Purdue, Cornell, MIT, and others, set the pattern. But our faculty and supporters did a great selling job, and we squeaked by. I believe it was about that time when we got the engineering building immediately north of Corcoran Hall to replace the "barn" and the EE lab was moved to the top floor of Corcoran Hall.

But before then, when the EE labs were still in Lisner, they consisted of a couple rooms where a variety of rotating electrical machines were available, along with a transformer, a mercury arc rectifier, and a couple of old arc lights. Enthusiasm, improvisation and energy made up for lack of modern equipment. For example, I built an electric tachometer for use in lieu of a mechanical tachometer, and calibrated it to read rpm from the output voltage. We didn't have modern digital reading tachometers in those days.

MECHELECIV: What is your recollection of matriculation and general registration procedures?

Wm.E.: I filled out some registration and class schedule forms and had them approved by Hugh Miller, Dean of Engineering. I processed them through the University Registrar and was ready to start classes. Dean Hugh Miller was a Princeton graduate, a dapper man with a moustache. I never got to know him nor President William Mather Lewis, as I did other and later members of the faculty and administration. The person I have known longest at GWU is Elmer Louis Kayser, our Historian. I have known him since about 1921.

GWU classes were taught in the daytime and in the evening. When I went there, night classes, euphemistically called evening classes, were taught for two reasons: first, there was heavy attendance by Government employees and others seeking to improve their educational level and their economic status, and second, those courses having only a few students registered and justifying only one section were given at night to cater to the night students. Hence, day school students were required to take certain classes at night. The two night sessions ran from 5:10 pm to 6:00 pm, and 6:05 pm to 7:00 pm. Then the academic students and those not taking laboratory courses went home. After dinner the lab sessions started at 8:00 pm and supposedly ran until about 9:30 pm. But in engineering we had to work until we finished the experiment. I remember many long nights in the lab. And every night in lab was not available for study at home. Considering the great value of our laboratory courses, I never understood the University policy of requiring 140 credit hours for a BS degree but only 120 for an AB degree (I believe those were the comparative figures). One could go to the University two hours a night for a few years and get an AB by sitting in a classroom listening to a professor lecture.

MECHELECIV: When you were in school, was there much "school spirit" among students in the School of Engineering?

Wm.E.: In my early days at GWU, there was little of what you'd call "school spirit" among the engineers; as a matter of fact there was almost hostility between the several branches of engineering. Part of the lack of school spirit could be attributed to the fact that a large part of our student body was employed in the daytime and went to school at night.

At some point, a few students who were feeling the need for a show of engineering unanimity founded Phi Theta Xi, a local engineering fraternity. I was one of the first initiates taken in on February 14, 1928. The President was Clyde V. Bryans, a civil engineer who had a distinguished career in the Navy Civil Engineer Corps during and following WWII. The Secretary was E. Farrar Goldberger, son of the distinguished scientist who identified the disease pellagra. "Goldie" was a brilliant student and would have made his mark in

civil engineering but his career was cut short by his suicide. In 1934, Phi Theta Xi petitioned Theta Tau and became Gamma Beta Chapter when it was installed March 16, 1935.

Prof. Ames had been one of the GW men most active in petitioning Theta Tau. He later served as Grand Regent of Theta Tau and succeeded founder Erich Schrader as Grand Scribe.

MECHELECIV: Would you care to comment on the curriculum available to you in contrast to what you know of the current SEAS curriculum?

Wm.E.: When I studied engineering, it was much more empirical than it is now. I don't believe engineering students today have a full appreciation of this. The scientific theory on which modern engineering is based is far more sophisticated than it was in my day. A comparative examination of text books will reveal this. I studied engineering in a period when more theory was being introduced via the newer text books. For example, the text for Thermodynamics (ME 20) was Part I (Thermodynamics and Prime Movers) of Elements of Heat-Power Engineering by Hirshfeld, Barnard, and Ellenwood, three professors at Cornell. It was a modernization of an earlier text by Barnard and Ellenwood. The authors spent little time on basic heat theory, per se, but developed the theory as related to specific prime movers and presented relevant curves, formulas, and developed empirical data for practicing engineers. Later, in 1937, I purchased for my personal use Parts II and III revised and published in 1933 and 1935 respectively.

Engineering handouts were full of "practical" formulas and design components with sufficient "factor of safety" for the working engineer. Prof. Platt always referred to "factor of safety" as "factor of ignorance." Our ignorance has been greatly reduced during the past half century. Machine design was highly empirical when I took the course. Probably the most useful guide for the designer was DER KONSTRUKTEUR by Franz Reuleaux. I used Kent's ME handbook and Machinery's Handbook. I still have my copy of the latter (revised edition of 1924). In Prof. Johnson's Machine Design class, we made use of what we learned in the Methods of Manufacture course so as not to design something that looked good on paper but could not be manufactured. I recall one of our problems was design of a punch press; another was the rather ambitious design of a small 4-cyl internal combustion engine. If it had been built, I still wonder if it would have run?

MECHELECIV: What do you recall of the specific academic subjects you studied at GW?

Wm.E.: My freshman year was a mixture of academic and engineering courses. English Rhetoric and English Composition were a requirement of all students. English rhetoric was taught by Dean William Allen Wilbur, Dean of Columbian College, from his text by the same name. I will never forget three quotations from his text: "Rhetoric is self-expression through language," "The style is of the man himself," and "A thing of beauty is a joy forever." For Composition, we had to write at least one of them a week, which is good training for anyone. They were on a wide variety of subjects; some assigned and some at the student's election. I would be unfair to the instructor (Mr. Baker) if I did not admit that I learned a lot about writing in that first year. Contrary to much engineering instruction, in my days at college our engineering faculty were conscious of the then common criticism: "Engineers can't write, draw, or speak." Our faculty marked our engineering reports down for the poor use of English. During my sophomore year, I took calculus and physics, including physics lab. I never did well at calculus; I understood the theory on which it was based but I was weak in the algebra part. Dean Hodgkins taught calculus. He had an infuriating way (to me) of writing a long equation across the black board with his right hand and erasing it with his left hand almost simultaneously, saying "It's simple, just algebra." I had a difficult time reconstructing all he wiped off so quickly. Prof. Chaney taught physics. The lab equipment was probably on par with much of that used by Michael Faraday in his demonstrations before the royal society. Some of the data taken was not the best but we made do and worked up our lab reports.

The only elective course I took during my work leading to a degree in EE was Psychology under the famous Dr. Fred A. Moss. The first semester we used Watson's and Woodworth's texts; the second semester the teacher's text on applied psychology. Not yet published, we studied from mimeographed copies. Later, after Dr. Moss had the book published, I bought a copy. Moss was a great showman; he and a group of his students made the newspapers when they staged a contest to see how long they could stay awake.

Dr. Moss proved to us in class how unreliable people are in observing and recalling closely related events. One evening he displayed to the class briefly in succession a set of auto license plates and a similar set made up like license plates but containing non-word letter combinations rather than numbers. Next he held up a mixed group of license plates of both types. We were required to mark on our recording sheets whether any of the last group had been previously displayed. Our sheets were turned in and the results announced in the next class session. They showed clearly that the students could remember non-word combinations better than number combinations. If this is true, perhaps license tags and telephone numbers should be

letter combinations!

Another night, Prof. Moss had a small group stage a brief dramatic episode, comparable to the sort of thing one might be called upon to testify in court. From our written statements of what took place, Dr. Moss proved conclusively that almost no one can recall accurately a brief series of related events. This test demolished the validity of most court room witness statements.

MECHELECIV: Who were some of the members of the engineering faculty when you were at GWU who stand out in your memory?

Wm.E.: John R. Lapham, who became Dean of Engineering when Hugh Miller left, taught civil engineering. He taught me Materials of Construction, a comprehensive course in all kinds of engineeringmaterials: cement, lime, plaster, brick, stone, timber, iron, steel, non-ferrous metals, etc. Plastics were not a building material in those days.

Frank A. Hitchcock taught civil engineering. He taught me graphicstatics, a course I very much enjoyed. I got to know "Hitchy" very well, and we ate dinner together each class night at Mrs. Wood's Woodshed, a restaurant on H Street between 18th and 19th Streets. We were barely into the course when he decided I knew enough to help him teach the class by helping some of the other students.

Professor E. M. Lee taught Engineering Mechanics and Strength of Materials. I recall the latter course well because each student had a Carnegie Steel Companion containing the propertiesof standard "I" beams and other steel shapes necessary for solvingclass problems. Note that this was before the now common "H" beams were rolled and came into general use. Most of us also had the then popular Hudson's Engineers' Manual as a "bible" for quick reference on mathematical and engineering data and formulas.

Prof. James H. Platt taught thermodynamics, power plant engineering,engineering economics, as well as some other ME courses. "Thermo" was a tough course for those of us who did not own a log-log duplex slide rule, because of the fractional components (e.g.,n = 1.6). I had only a polyphase duplex slide rule, but solved some of the problems using Naperian logarithms. Prof. Platt drew his P-V-T charts on the blackboard using three colors of chalk. He found one of our classmates was color blind. Each time he drew a diagram in color he would solicitously ask, "Mr. -------, can you see that ok?"

Prof. Ben Cruickshanks taught various ME courses including hydraulics, hydraulic laboratory, strength of materials laboratory, and power plant laboratory. We ran performancetests on the internal combustion engines in the "barn" at night. The engines were noisy and sometimes the tenants in the Marion Apartments would complain to the police. We had to close down at 10:30 one night without a full set of data when "the law" appeared and said we were disturbing the peace!

The Electrical Engineering Department in those days consistedof Prof. Norman B. Ames assisted by Professors William F. Roeser and Alfred G. Ennis. Prof. Ennis (called "Squire" by Prof. Ames) taught us electric power transmission. We had to draw "circle diagrams" and compute transmission line stability. I'd hate to try and do that now, 54 years later.

Prof. Ames taught me most of my EE courses: dc theory and machines, ac theory, ac machinery, part of EE lab, Electric Railway Engineering, etc. Of the number of EE courses devoted to application engineering, my favorite was Electric Railway Engineering. Later, before I was called to the military service in WWII, I taught it and the EE lab as well. "Deacon" Ames (I named him that) was one of the best known personalities on the campus. He had a law degree from GWU in addition to his EE degrees. He was a strong advocate for training engineers in public speaking. I had a long association with him as student, teacher, and fellow associate in fraternal and other campus activities.

MECHELECIV: What are some of your memorable experiences in classes you took as an engineering student at GWU?

Wm.E.: One of the courses I took was engineering economics, as an early morning class one summer about 7:00 before going to work. If one had been up late the night before and it was a warm morning (remember, this was in a time before air-conditioned classrooms!) it was hard to stay awake. Prof. Platt gave us, as one of our major problems, the task of going and listing every component in a small building, extending the totals, and pricing the materials. It was the sort of work done by a construction contractor's estimator.

In the heating and ventilation course, the big problem was to design a complete steam heating system for a large office building. We used the climatic conditions for Washington, D.C., and were furnished the building description dimensions and orientation. There were a great number of slide rule computations and pushing involved in that assignment. I don't believe engineering students today have any appreciation of the time saved by use of the electronic calculator over the slide rule, to say nothing of the use of computers. We had to calculate heat loss through walls, roofs, windows and doors, air infiltration, air changes required, size of radiators on various exposures, as well as boiler size, and piping layout.

For some of the ME courses, we ran performance tests in the

"barn." To me, the most enjoyable test in the barn was an all-day power plant performance test. The boiler was of the vertical fire tube type, supplying steam to a simple "D" slide valve engine belt connected to a dc generator. We loaded the generator by cables connected to steel plates that could be lowered into a wooden water tank containing salt water. The more plate area in the salt solution, the greater the load. Obviously, the overall efficiency of such a system was low but the methodology was what counted.

We weighed coal in and ash out, the water used, we took temperature and pressure data, read engine speed, took steam engine indicator cards to obtain indicated horsepower, and read voltage and current for electrical output. As I recall, our data sheets on columnar accounting paper required at least 24 columns. We started about 8:00 am and ran until about 5:00 pm. It took a while to get the system running smoothly before taking test data. There were enough data points and data required that no one stood around with his hands in his pockets. This was but the prelude to many hours of calculations by slide rule--after using a planimeter on the engine indicator diagrams to get indicated horsepower.

MECHELECIV: You taught at GWU as well as being a student there, correct?

Wm.E.: Yes I was one of several Engineering School graduates employed part time as instructors in engineering. Prof. Ames, recalling my great interest in Electric Railway Engineering when he taught the course, suggested that I teach the course one year. This I did in 1940-41. While a student engineer at General Electric Co., I took their "General Course" in engineering and business. The engineering part of the "General Course" included a major section on Transportation , which was of special interest to me. I made use of the material from this course when teaching EE-127. I expanded it slightly based on my GE experience to included lectures on electric elevators (vertical transportation) and marine ship propulsion (ocean transportation).

The next year Prof. Ames asked me to teach EE lab. By this time, the EE lab had moved to the top floor of Corcoran Hall, and we had the modern lab benches I have referred to before. All went well until I was to be called up for military service as a Reserve Officer. I had been commissioned from civil life, based upon my engineering training and experience. President Marvin appealed to the War Department to defer my date of reporting until I could carry my class through the first semester. This was done and I went on active duty in March 1942.

MECHELECIV: Did you develop a general interest in engineering education from your teaching experience?

Wm.E.: Actually, my interest antedates my teaching and includes an interest in engineering ethics. I was quite active in the Washington Section of the AIEE, holding various committee chairmanships prior to serving as Section Chairman in 1955. Over the years I have accepted a number of offers to speak to audiences about both the education and the responsibilities of engineers. In February, 1967, the Engineer Alumni Association held a panel discussion for graduating seniors entitled "What Engineers Do." The purpose was to acquaint those seniors not already employed in engineering as to various fields of engineering rather than disciplines, per se. Bud Wareham and I, together with Lee Hines and Vincent Lee-Thorpe, composed the panel with the latter serving as moderator. Our combined fields of activity made it possible for us to cover engineers in consulting work, industry, utilities, construction, and government (both civil and military employment). Approximately 40 students attended and questioned the panel.

In the fall of 1968, I participated in the "Engineering Seminar for High School Students" of Montgomery County, Md. It was held on five Saturdays at the National Bureau of Standards Audi-torium, Gaithersburg, Md. All high school students in the county were invited, and a considerable number of the attendees were girls. The seminar was sponsored by the GWU Engineer Alumni Association, the professional engineering societies, the Washington Society of Engineers, the DC Council of Engineering and Architectural Societies, and the NBS.

In December, 1969, at the request of the State Department, I talked informally at the Foreign Students Service Center to students studying engineering here in the Washington area. Several were from GWU. My wife and I had entertained a number of foreign students in our home. The December 28 meeting was very informal, at which time I endeavored to show them the vast possibilities in the engineering field, and to answer their questions.

MECHELECIV: How do you see the state of engineering education today?

Wm.E.: I have some definite views on what I see are some of the problems of engineering education in our country today. I do not need to tell you that engineering and science, growing at an exponential rate since WWII, have changed the world so that engineering is far more important and all pervasive than it was when I was a student. Hence engineering education has had a serious problem keeping up with the constant change. Obviously, I would not suggest returning to engineering education as I knew it in school.

As far back as 1940, Prof. D. C. Jackson at MIT said, "We must get

our students to reflect on the economic and social implications of engineering without lessening their mastery of the scientific relations." Similarly, in a letter I wrote to IEEE in 1969 I said, "The day has long passed when engineers can disclaim responsibility for the economic and social consequences of their work." We must accept our responsibilities as engineers and as concerned citizens. The problem then is the relation of the practicing engineer to the public and, since the students of today will be the practicing engineers of tomorrow, the engineering student must be prepared to face the problem.

My fear is that too many engineers are lacking in sufficient liberal education. Dean Linton of Columbian College has said, "A liberal education is the core of beginning to learn about oneself, the environment, the society and its values." To make matters worse, engineering is not looked upon as a "learned profession" as are law and medicine. We don't use Latin legal terms or Latin medical terms as lawyers and physicians do, which confuse clients or patients. Our profession goes back at least as far as law and medicine, but it evolved in a different manner. Probably the most significant difference between engineering and the two professions of law and medicine is that the latter have become graduate schools requiring, as a prerequisite for entrance, the liberal education provided by a curriculum leading to the A.B. degree.

Another difference between engineers and lawyers or doctors is that lawyers and doctors deal with the public on a day to day basis, whereas a considerable part of the engineering profession does not deal with the public at all. Hence these engineers do not feel the same responsibility toward the public that lawyers and doctors feel.

The "simple" solution would be to make the engineering school a graduate school requiring the A.B. degree as a prerequisite for matriculation. This has been considered and debated in the American Society for Engineering Education but for various reasons not adopted in general. I am not sure, but I believe there are some engineering schools that require at least a couple of years of academic work before facing the engineering curriculum.

There are advantages and disadvantages to elevating the engineering curriculum to graduate status. If my estimate is correct, some 17% of the credit hours at our school are devoted to liberal arts courses. If an A.B. degree were required for entrance to engineering , then these courses, already provided for, could be eliminated and the time devoted to additional engineering courses. But the disadvantage would be doubling the time in college from first matriculation to receipt of the first engineering degree. It would also double the cost of course education.

Graduate instruction in engineering is desirable for some students depending on their future field of work, but specialization is dangerous if taken too early in one's career. This leads me to one of the greatest problems today brought on by our complex technological civilization: the problem of the generalist vs. the specialist. Both are necessary, but inevitable conflicts arise in every endeavor: in government, in the military, in industry, in commerce, and even in the university. Dean Linton has reminded us that overspecialization has reached epidemic proportions and that therefore liberal education is of importance to try to achieve some balance.

My fear is that the engineering schools will continue to turn out engineers qualified technically but otherwise illiterate---suffering from what President Gordon K. Chalmers of Kenyon College called a lack of "moral maturity." This fear is not for our school alone. College is but part of the educational process. There are many sources, including GWU SEAS, offering continuing education dedicated to keeping the engineer abreast of new developments in his/her field. But these relate to professional rather than general education. The problem is to induce graduates to undertake post-college general education either through formal courses or by a self-imposed program of reading. When I was an undergraduate there was an old cliche: Engineers can't draw, can't write and can't speak. Mechanical drawing is not of great consequence now that we have CAD/CAM. I don't know how rigorous the freshman "communication" course is; we had to write a theme a week during our freshman year. Prof. Ames was a great advocate of public speaking for engineers. Active participation in engineering society activities is valuable for young engineers. They meet people of similar interest, have an opportunity to participate in discussions, and to present technical papers.

As the young engineer progresses up the ladder in his profession, he will most likely become a candidate for a managerial or administrative position. His success or failure will depend more on his non-engineering skills than on his engineering background. He will have moved from being a specialist to being a generalist.

My last point concerns the engineer's relationship with the general public. Not only must he do good engineering work, but he must also be prepared to defend it, so as to convince the public that it is desirable,and will not create socioeconomic problems of a disturbing nature. Our engineers then have a twofold responsibility: to lead our country technologically, and to educate the public on all matters in their fields of expertise, particularly as they affect socioeconomic considerations.

George Pida received his Bachelor's Degree in Electrical Engineering from the George Washington University in 1947. While studying at GW, George Pida served in numerous volunteer and extracurricular activities. His prominence and popularity amongst his peers is reflected in the article about him in the March 1945 MECHELECIV (see box, page 15). Without his efforts and those of his peers, we would have been deprived of the wonderful tradition that MECHELECIV has come to be.

The MECHELECIV

How It All Began

By George Pida, BEE, 1947

"December 7th brought to our lives a way of life unknown to us. The already racing pace of civilized life was doubled and those of us that [sic] thought we were doing a full days [sic] work suddenly found we could do much more."

It was this thought and the enthusiasm of Fred Holcomb, editor of the first issue of MECHELECIV, that I will always remember - especially that evening in July 1942 when he brought rough drafts of an assortment of reports on George Washington University student engineer activities to a hot, stuffy furnished room on upper 13th St., N.W., for typing onto ditto masters by my wife, Josephine. Reflections on the events associated with the publication of the first issue that July produce vague images and warm feelings for the GWU engineering students I still remember.

That first issue of the MECHELECIV, in now faded purple ditto reproduction, is in striking contrast to the polished revival issue of Nov.-Dec. 1983 edited by Abid Kamran. But when in memory it is embellished with the remembrance of the students involved in its publication, it does stand out as a worthy predecessor to the Nov-Dec 1983 issue.

My title of Publisher of this first issue is mostly based on the fact that my wife did the typing on the masters that Fred borrowed from the Engineers' Council. I helped with plentiful advice as I remember. George Kalv earned his title of Printer by arranging the loan of a copying machine to run off those first pages and for assembling them into a package.

Fred Holcomb gave birth to this idea of a GWU student engineers' paper, and, in rap sessions with several fellow students, the title "MECHELECIV" was devised. Fred not only contributed directly to the first and subsequent issues of the paper but was successful in persuading other engineering students to sustain the life of this publication. In the interval between the July and November issues in 1942, Fred succeeded in increasing the MECHELECIV staff from the original three to eleven people. The group included columnists for the three student engineering societies, ASME, AIEE (now IEEE), and ASCE, as well as two engineering fraternities, Sigma Tau, and Theta Tau, which were currently established on campus. They were Robert McCullough for ASME, Dominic Toffolo for AIEE, Bill Randall for ASCE, Mort Rabineau for Sigma Tau, and myself for Theta Tau. The other six people were assigned duties: editors - Fred Holcomb and Lou Berkley; column coordinator - Raphael Cahn; mailing manager - Michael Bondy; and printers - Harold Thomasson and Dirk Brady. After serving as Editor for the first issue, July 1942, Fred became Associate Editor for the Nov. 1942 issue and continued in this position until Nov. 1944 when he again became Editor and remained so through the second semester of 1945.

It is interesting to observe that most noteworthy beginnings are spawned by the individual. Fred felt there was a need for a media vehicle to foster a spirit of union and fellowship among the engineering students of GWU. He had a very strong sense of loyalty to the Engineering School, the faculty and his fellow students. Since most of the students had full-time jobs and often carried a heavy class load, time was at a premium. This fact was expressed quite eloquently by Fred on the first page of the first issue dated July 1942:

"We at George Washington are fortunate in that we can serve the Nation doubly by using what training we have toward the War Effort, and by augmenting this training here at night school so that we may later even better serve in the Nation's production lines."

In his editorial on page 3 of the July 1942 issue, Fred spoke to all of us:

"This is the first edition of this engineers' paper and we hope it will grow into a regular feature of the Engineering School at George Washington. Its future is in the hands of you, the students of the Engineering School...

"It is the aim of this paper to bring to the Engineering Students news of the Engineering Activities and of general engineering interest and to promote any ideas that may come our way."

The editors and the columnists of the several engineering societies and the two professional fraternities followed this guideline by reporting many items besides the routine, technical and social activities. Here are a few examples from the Nov. 1942 issue:

"Brother Finan (a Theta Tau

fraternity member) was killed in action in the Solomon Islands. He was a Lt. in the Marine Corps"...and "Margaret Bain...first girl in the Engineering School...father - M.E. in air conditioning...from Sanford, N.C...long locks of blond hair donated to the War Department for precision instruments...height 5'7"...weight 159 lbs...serene southern accent...blue eyes."

Also: "No doubt those of you who weren't to [sic] the picnic at Professor Akers' home, are kicking themselves for missing such a swelegant time. A vote of thank [sic] thanks is in store for Prof. and Mrs. Akers, and we hope that at the next meeting some action will be taken to present a bouquet to Mrs. Akers, both for her friendly hospitality and also for her kindly [sic] accompaniment at the piano." Dominic Toffolo's report in the column "Short Circuits" was from the heart, not the English Department.

Not until November 1942 did there exist an Engineers' Lounge and it soon acquired a "new name." "The new Engineers Lounge in M.E. 301 has been dubbed by the Physics Dept. and particularly by Dr. Cheney, as "The Roughnecks Rendezvous"" was reported in the MECHELECIV of Nov. 1942.

The American Society of Civil Engineers had this to say in regard to encouraging students of this discipline to meet (as expressed in the July 1942 issue):
"The Civil Engineering group here at George Washington has managed to meet together every so often in order to have a chance to know themselves better and to learn of things not found in the classroom. It is a pity that not <u>all</u> the Civil Engineering students take advantage of the many pleasures and privileges extended by the student Chapter of the American Society of Civil Engineers. Students are generally skeptical about joining anything without knowing exactly what they are getting into and what they are going to get out of it. It is a difficult task to tell anyone he is going to benefit because that depends on each individual himself...And it should be the duty of every C.E. to find out how he can add to the group and how he can benefit from it."

Sigma Tau expressed well the feeling of concern for our country and desire to help in the best way possible when, in the November 1942 issue, it declared:

"In order to cooperate with our government in furthering the training of Engineers for the war effort, the University is now on an accelerated schedule. Acceleration, plus the uncertainties of the future, has led many new students to acquire the habit of glossing over their subjects in an effort to obtain a larger number of semester hours."

"Sigma Tau wishes to stress the necessity of thoroughness of application in the pursuit of the initial Engineering subjects...

"To reward a job well done, Sigma Tau has decided to award its Freshman Medal to the student maintaining the highest scholastic average for his freshman year, this spring. Students entering school since Sept. 1941 will be eligible for this award. So lets [sic] go fellows - help yourself, and Uncle Sam, and perhaps win an award all in one stroke."

Evidence of patriotism and concern for the war effort appeared in each issue. Slogans such as - "A STAMP A DAY KEEPS THE AXIS AWAY" and "BUY BONDS FOR BOMBS" plus "SHOW YOUR THANKS TO THE YANKS. SAVE WAR BONDS AND WAR STAMPS" and "ARE YOU HELPING THE WAR EFFORT?" illustrate this.

So, beginning with a feeling of the need to unite at a time of great stress in our country, and continuing intermittently for 42 years, the MECHELECIV is still in evidence. It is my fervent hope that the revival of the MECHELECIV will inspire the engineering students to sustain the publication into the distant future. I am sure it will provide the cohesive force that will help bind past, present, and future members of The George Washington University School of Engineering and Applied Science.

ENGINEERS and PEOPLE

George Pida (Rhymes with Ida), a pillar of the E.E. department, was born a long time ago in Arnold, Penna. He attended school in McCauly and Sutton Hills, Deerfield Township, Warren County, Penna. (Whew!). The famous high school in Tidioute (famous in Tidioute, 50 miles from Erie) is George's Alma Mater.

Pida drifted to D.C. in 1931, enrolled in Bliss Electrical School, and followed that up with a session at a business college. GW became George's source of annoyance in 1935 and has been with him ever since. He says he really <u>labored</u> the first four years.

However hard he worked, George always found time to be the Engineering School's Man Friday. He is a member of the Engineer's Council, Treasurer of Theta Tau and past-chairman of A.I.E.E. The Naval Research Lab claims George eight hours a day for usually seven days a week.

George tied the holy knot with Jo Drinkwine in 1942 and one of the results of this union is Ellen Mary, a 22-month old bundle of charm.

Anything that's not poisonous and still liquid is George's favorite drink. His favorite hour is around 6:30 a.m., when the telephone rings and it's time to go to work. Nope, he doesn't trust the alarm clock.

George Expects to graduate —.

Reprinted from March 1945 MECHELECIV

REFLECTIONS OF A WARM BODY

Marjorie Rhodes Townsend
BEE '51

Reflections of a warm body? Almost forty years ago my classmates in thermodynamics class nicknamed me the "hot body." I don't remember whether anyone called me that to my face - probably not - but everyone knew. Today we would call it sexual harassment, but it was meant as a friendly kind of teasing of the only female in the class.

One of the good things about engineering education when I went to GWU was the requirement to take a variety of basic courses in other disciplines of engineering besides your own. It truly provided a solid base of education. For me, one of those courses was surveying. Evolution not withstanding, I was truly a cold body when I took surveying during the winter term. We, like many students before us, resurveyed the tract of land bordered by Military Road and Oregon Avenue. If one of my fellow students hadn't chased me around the field (guess what we would have called that today), I would probably have frozen to death hanging on a tripod. Both the temperature and the equipment were very much in contrast to the time I wandered around a piece of Kenya with a surveying crew and their infrared sighting equipment almost thirty years later. But basic surveying skills learned at GWU stood the test of time.

A pair of courses required of EE students in the 1940's was Mechanical Drawing and Descriptive Geometry. The former was easy; the latter gave me a lot of trouble. Descriptive Geometry may have been the only course I ever dropped. The primary reason was the teacher. When he became perturbed with the students for any reason, he threw chalk at them. This seemed to be in lieu of teaching and the classroom was a veritable missile ground. (I always suspected he had some sort of problem). Descriptive Geometry was also the class in which one student told jokes, (which must have been absolutely filthy, although I was too naive then to understand them) just loud enough for me to hear.

Marjorie Townsend spent 8-1/2 years of her professional career at the Naval Research Laboratory and 21 years at Goddard Space Flight Center. Most recently she was Vice-President for Space Systems Development for Space America and is currently taking a temporary break in order to travel.

I matriculated in GW's School of Engineering at the ripe old age of fifteen and a half in the fall term of 1945, having skipped several grades in elementary and junior high school. When I planned to go to the Engineering School - I'd have done anything to avoid having to take History - my Daddy told me I'd have to smoke big, black cigars at the Engineers' Smokers. But Daddy always teased his only child. He was wrong, of course, and I have, in fact, lived to see the day when very little smoke curls upwards when engineers get together. Logical people, engineers - they look at the statistics.

Unlike many horror stories I have heard of the mental harassment accorded to other female students in my era, other than the single incident of dirty jokes mentioned above, I can recall nothing unpleasant. The professors generally seemed to look upon me as a daughter, and the students, most of whom were returning World War II veterans, looked upon me as a younger sister. Many of them were married and they were almost all very serious students bent upon getting their education. They simply didn't have time to bother about one stray female in their classes. That isn't to say that the teachers and students were not aware of me. How a teacher of electrical engineering happened to be talking about bastard files I cannot recall, but I do remember how awkward the moment was when Professor Ames remembered I was in the class. I am sure a lot of the normal language was toned down while I was around.

From studies done of women who studied engineering in the early days, I seem to be typical. We tend to be the oldest or the only children in a family with a close father-daughter relationship. Despite his teasing, my father encouraged me to study engineering and was very proud when I finally graduated, even though it was in a Catholic University gown. As usual, someone had fouled up and the Engineering School gowns sent to GWU for the big event had the right color hoods, but the Catholic University colors instead of buff and blue.

On the other hand, my youth may have protected me from some of the less desirable parts of the engineering curriculum. In the electrical engineering lab, Professor Ames had a habit of "testing" the 220-volt line by touching it with two of his fingers to see if it was alive. He would say, "I can't feel anything; would one of you boys like to try it?" Some poor volunteer would try, and then get zapped for his trouble. We always figured "Deacon" Ames had very dry fingers, but he could take that 220 volts without blinking an eye. Watching this must have

created a major metamorphosis in my genetic structure since my eldest son used to take off his little belt and stick the prong into the electrical socket. This large charge for a small boy never seemed to bother him.

I began my GWU education in 1945 but didn't get my degree until 1951. I had reckoned without meeting a young pre-med student by the name of Charles (Chuck) Townsend, whom I married in 1948. Years later I learned that there was more than one bet made that I would get married and not finish school. At that time, those people betting that I wouldn't finish must have been feeling pretty sure of themselves, but one of the many blessings of GWU was that any course they offered was given at night, so I was able to work during the day and finish my last year at night, even though it took three years to do it. Many years later, one of our neighbors, upon learning that I had been married at 18, said, "Oh, then Chuck is your second husband?" I guess she assumed anyone married that young couldn't have known their own mind. But I also remember registering for classes in the fall of 1948 when someone called out, "Mrs. Townsend!" I spun around in answer and he said, "Just testing to see if you know your name!" Funny man, of course I did! Now, after being married 2/3 of my life, I can scarcely remember any other name.

Unfortunately for me, I never learned to study before going to college, so I know I wasn't able to take full advantage of the education offered me. I had learned, however, how to participate in extracurricular activities, and I threw myself headlong into many of them, not the least of which was the MECHELECIV. Not all of the back issues of MECHELECIV are in the files, but I see my name as Features Editor of the February 1946 issue. Associated with MECHELECIV, also, was Bernadine Dunfee, the only other woman taking engineering courses at GWU in those days. MECHELECIV must have had a problem - our Editor probably graduated - or I never would have tackled being Editor in my sophomore year, even for a few months. I can remember having the make-ready all laid out on the ping-pong table in the basement of my parents' home on Christmas Eve 1946, and dashing from one side of the table to the other trying to get it ready to reproduce. I believe that John Slothower was there helping me.

Other memories filter through the years - sorority and fraternity parties, playing bridge in the Student Club and classes. And we all dressed like young ladies and gentlemen. A few years ago, when I was presented with one of GWU's coveted Alumni Association Achievement Awards at the February 1976 commencement, I was astounded to notice that one young woman, representing the best in her particular School, receive the token diploma wearing blue jeans and sandals under her black robe.

The School of Engineering shared Corcoran Hall with the Chemistry and Physics departments. It had no attractive building of its own as it has now. (It was early in 1947 when Charles A. Tompkins donated $22,500 to the University toward the construction of such a building. Small wonder it is called "Tompkins Hall".) In the old electrical lab, I used to arrive early to get the experiment set up and checked out by the teacher. The whole plan was to be able to run the experiment after the rest of the team got there, and get out early. Somehow, it never worked out that way. After the rest of the team arrived, they tore it all down and set it up again - and then I was relegated to recording the data, not reading it, just recording it. And I never got away early. I always liked to get my work done and out of the way, but not everyone is like that. On the day I got married I went down to GWU to pick up my lab reports at the end of the semester and one of my classmates was just turning his in!

Bill Carley was one of those teachers who managed to intimidate the most fearless of students, but I'm one of those who was too dumb to be intimidated. Anyway, one day I came to class a little later than normal only to find a red book lying open on my usual chair. Sitting down, I noticed that it was an engineering text written in French. Mr. Carley boomed, "Mrs. Townsend, would you please read to us from that book?" When I asked him whether he wanted it read in French or in English, he answered, "In English." Little did he or any of my classmates know that I had studied French for six years and, despite a fundamental lack of ability in languages, still knew the basics well. That coupled with the international terminology of engineering terms allowed me to translate the text and read it almost flawlessly, which I did absolutely deadpan. After about two paragraphs of this, he said, also deadpan, "That's enough, thank you." From time to time, it was fun to try to "get" Margie, but that was one time it backfired.

Needless to say, I have very warm memories of my days at GWU and of the many friends I made there. The women of today are more fortunate, perhaps. There are more role models; I had none, but of necessity I became one. It was fifteen years later after I received my BEE that GWU graduated their first female BME. More years passed before there was any significant increase in the enrollment of female engineering students. Even ten years ago, there were only 8, representing about 2% of the 344 students enrolled in undergraduate school. But, fortunately, things are changing. Now there are about 16% women in SEAS - enough female classmates with whom to commiserate about some of the problems of being a minority group in an engineering world that is still populated primarily by men and enough to form the basis of an "old girls" network equivalent to the very important "old boys" network that functions so well. And the men are more accepting. I find it very exciting. I've always felt women were a great untapped resource for engineering, and they are beginning to show that it's indeed true. Watch out, world, here we come!

John R. Manning, BE, 1957

John Manning is one of only two alumni who have been president of both the Engineer Alumni Association (EAA) and the General Alumni Association (GAA) of the George Washington University. He also received a degree from the Law School in 1961. John has been active in volunteer service to SEAS and the University since 1965.

He has served as secretary, vice president, and president (two years) of the EAA, and was one of the people responsible for reorganizing the EAA (1967-68) into its present structure, which is operated by a Board of Directors of fifteen alumni. He has maintained his active involvement with the EAA continuously since 1965 and received one of the first two Engineer Alumni Achievement Awards given by the EAA (1974).

John has been a member of the Governing Board of the GAA since 1965 and received the Alumni Service Award in 1975. He has served on many committees of the GAA, was vice president 1982-84, and is presently serving a two-year term as president. While he was working in the Boston area, he served as a regional representative to the GAA and president of the Boston area regional alumni association. For many years he has been active in fundraising activities of SEAS and the University, through his participation in the Washington area phonathon. He has also participated in regional phonathons and has worked extensively to recruit alumni for phonathon service. John has also been active for a number of years in the Business and Community Support Program.

John has maintained regular involvement in professional activities in the fields of both engineering and law and has been a member of the Board of Directors of the Washington Society of Engineers. He has been an employee of NASA for many years, serving in the Office of Patent Counsel.

E.A. "Bud" Wareham 3rd, BEE, 1953

Bud Wareham has been president of both the Engineer Alumni Association (EAA) and the General Alumni Association (GAA). He became active in the EAA in 1965, was elected president in 1966 and was heavily involved in the reorganization of the EAA in 1967-68. He served as secretary and was president for three years (1966-69). During that time he also served on the SEAS Advisory Council. He received one of the first two Engineer Alumni Service awards presented by the EAA in 1974. He also received the Engineer Alumni Achievement Award from the EAA in 1980.

In addition, Bud has been involved with the GAA for many years. He became a member of the Governing Board in 1966 and served on that board for twelve years. He served as vice president of GAA for two years, 1972-74, and as president for two additional years, 1974-76. Among his service activities for the GAA was membership of the Ad Hoc Commission on Alumni Goals and the Steering Committee for the All-University Assembly. Bud received the Alumni Service Award from the GAA in 1971.

Bud Wareham was also active in fundraising activities of the EAA, having served as chairman of the Engineer Alumni Support Program while he was president of EAA. During his active years with the EAA and GAA he also participated in many of the phonathons and in the Business and Community Support Program.

Bud has been active in design and consulting engineering since 1949. He became a partner in Cotton and Wareham, Consulting Engineers, in 1973, and simultaneously formed Wareham Associates and WBQ Engineers, Inc. in 1978. He is Chief Engineer and Business Manager for both firms. He has won more than ten prizes and awards in lighting competition, including selection as "Man of the Year" by the Consulting Engineers Council of Metropolitan Washington in 1967.

The School of Engineering in the 1950's **Recollections of Two Alumni**

The following conversation took place between John Manning and Bud Wareham, both past presidents of the Engineering Alumni Association. We asked them to reminisce about their experiences at the George Washington University School of Engineering in the 1950s, and to contrast it with today's world. The following is the result.

Bud: John, what were your first impressions of GWU and what was the source of these impressions?

John: Well I think my impressions were gained a lot from the school catalogue. I remember the school catalogue as a small booklet of 20 to 30 pages. It was nothing like the students receive today. We had the option of 3 or 4 different courses to study and that was it. Prior to coming to George Washington I studied and memorized it, drawing some conclusions of subjects I wanted to study. I had visions of what the staff might be, the living conditions in the dorms and the physical plant. The day I arrived I found how true my dreams and fantasies had been.

Bud: I unfortunately did not get exposed to the catalogue since I transferred to GW to take advantage of the evening classes. I remember the courses of study you could take were electrical engineering with power or electronics options and civil engineering and mechanical engineering. The choices were pretty much limited to those and we certainly did not have all the options available today. One thing I remember about GW was the evening classes. That was the appeal GW had for me. I could work full-time and still get a degree. I had been going to Maryland full-time but felt that I wanted to get some work experience. I did get a summer job in engineering and I then decided I wanted to stay on that job rather than return to school full-time. The only way I could do that was to transfer to GW and take my courses at night. That's how I arrived at GW. They offered evening classes, and most of my courses could be transferred. They also, offered a power option which was my primary area of interest.

Bud: John, before you got to GW what were your impressions of engineering and how did they change when you got there?

John: I guess I thought of engineering more as work performed by a technician rather than an engineer. I had sole exposure to different courses of study in high school, and there I had the choice of taking college preparatory-technical or college preparatory-liberal arts. I chose college preparatory-technical. In that area, the curricular emphasis was on technical science and technical technology. I had to make a transition from thinking of being a technician to being an engineer, a higher and more professional work level. I have spoken to engineers that graduated long before I did, and they say they were the real engineers and we who came along later were the technicians, but I think we are the engineers. I admire the students today. They're in a class by themselves with their knowledge, their ability, and their skills, which are way beyond what I ever imagined.

Bud: Or what we were taught. I went into engineering because I wanted to be an engineer. I had no idea specifically what an engineer did or what kind of jobs were available. It wasn't until well into my engineering education, after getting out in the work world and getting some experience, that I learned of the many possible choices for engineers. Our high school really didn't give us any specific guidance about engineering careers. I knew that there were engineers in the world, and it sounded like an interesting profession, but as far as what you would actually do as an engineer, I didn't have any idea. When I got to GW, I was exposed to a number of highly experienced (in teaching) elderly professors, as well as professors who were working full-time in the profession and came to GW to lend some of their expertise. Two I remember in particular were Dr. Harris, who worked for the Bureau of Standards and had written the textbook on measurements we used, a very scientific, technical person; and Ben Slingloff from PEPCO, who taught a course in power distribution. The feeling I got from this exposure was that this was a "learned profession" and that somehow all this information and wisdom was going to seep down to us. There was almost a "mossy" feeling of a great mysterious wisdom going to be given to us at some time before graduation.

Bud: Were you a nighttime student, John?

John: Yes, mostly, but I also took a few courses during the day. I had determined that the way to go through school was to live close to school, so I was able to have a little bit of flexibility in my job as far as courses were concerned. I remember Dr. Harris - he was the type of professor that a lot of us sought out. I recall taking a course in semiconductors or transistor circuits from a professor who worked full-time at the Naval Research Laboratory because I knew he was doing the actual design work himself, and this was the sort of information I wanted to get. Speaking of transistors, I don't think the school offered a course on this subject until the summer of 1954 or 1955. Some other undergraduates and I signed up for the course, but we found that very shortly we had to drop it. Since George Washington was one of the earliest schools to offer this type of course for credit, it was mostly filled with experienced graduate students who were taking the course to get graduate college credit for it. We found very quickly it was well over our heads and we dropped out.

Bud: In thinking about professors with personal engineering experience, another professor that I remember was Harold Urting, who was a lighting engineer for PEPCO. He taught a night course on illumination and could bring to the course his daytime practical experiences. By this time I was working in the field as a Junior Engineer and could begin to appreciate some of the problems. I recall asking him some questions that had arisen in my job, and he was able to help me with them. A number of the professors we had were of that practical type that were working in the area that they were teaching. Some of the things that I enjoyed most and benefited most from at GW were the reminiscences and anecdotes

having to do with their full-time work experience that the various professors would insert in their lectures. We began to get the feel of the "work-world engineer" which up to that time we had been completely unaware of. One of the other courses that I remember was a course that Dr. Ames taught, "Electrical Traction," of all things. There were conversations during the course that this subject was really something for the "old" days; it was unimportant and wouldn't have much application in today's world. The course was dropped a year or so later. Now I look today at the new opening of another 6 miles of Metro and which is obviously an application of "Electrical Traction" and I wonder. The courses were very specific in those days and quite a few of them emphasized practical applications. In today's engineering education there is much greater emphasis in the theoretical area, with the practical applications expected to follow when you start to work or begin graduate study. Do you have any other particular recollections about your professors?

John: You mentioned Norman B. Ames a minute ago. We were always fascinated with Norman B. Ames and impressed with the number of graduate degrees that he held (at least six master's degrees). Each year an award is given in his name to a graduating senior who has made significant contributions to the student community, the School and the University. I know there has been some effort on the part of Abid Kamran to find out more about him. Many of us "older" types remember him well. Just before he died, he received a doctorate from a university in Europe, probably in Switzerland. He had been on a year's sabbatical leave, teaching in Ceylon. There he found he had cancer, came back to the States and died shortly afterwards. He always gave a pretty solid course with a lot of reminiscing, but there was always something to be learned. At the start of the class he would always ask if we had any questions to ask about the assignment that day, that was the time to ask since we may not get back to that subject again. He might talk about literature, a trip around the world or whatever else occurred to or was suggested to him. At the time we thought that it was not the proper use of a professor's energies, but we found it very interesting and enlightening, adding to our all-around experience at what goes on in the workaday world.

Bud: The only course I took with Professor Ames was the electrical traction course and a great deal of reminiscing took place in it. Although he was getting old then, it was evident that he was very intelligent and that he was very involved in the course material. What we got out of the course itself was very little, mostly his reminiscences and anecdotes. Another professor and course I remember, with a somewhat feeling of horror, was Materials in Engineering. This course taught by Dr. Trumbull was so dry that when you opened the door to the classroom a cloud of dust would seem to rise from the floor.

John: I remember Dr. Trumbull.

Bud: It was the most boring and uninspiring course. We would sit there at six o'clock in the evening and doze through most of the lectures that were read from the textbook to us. However, some of the course content seeped through to us in spite of its being the driest and most boring course that I can remember at GW. The professors, the old timers, that were teaching the course, were my biggest impression of the School. The facilities themselves reflected that same "mossy" feeling. We had laboratories in the basement of Corcoran Hall and the equipment looked like it was held together with bailing wire and tape.

John: It was of World War I vintage in some instances.

Bud: I can remember with Dr. Cruickshanks running some steam boilers over there, measuring many things, and wondering what kind of results we were really going to get. We never did get the correct results, even after many tries, because of the antiquity of the boilers and the instrumentation.

John: We as alumni are very proud of Professor Cruickshanks, because he is a graduate of the George Washington University School of Engineering who stayed at GWU for his entire teaching career. I took thermodynamics from him and I thought it was an excellent course. We still enjoy talking with him from time to time, especially since he still joins in many of our alumni activities, and is certainly a Grand Old Man.

Bud: I remember that the classes were held in various buildings on campus. Tompkins Hall had not yet been built, so most classes were taught in rooms in Corcoran Hall and the labs were in an annex to it. Most of the equipment was really old, as you said, of World War I vintage. The whole school physical plant was considerably smaller in size, than now. I can't remember any new construction projects during the time I went there, although the exposure of most night school students to the University was rather limited. I don't even really remember too many people that were in my classes, because we all came into class and went home or went to the next class and then went home, without really getting to know many people. Did you ever get to live in the dormitories?

John: Yes, my experience was a little different from yours. I received my entire undergraduate education at the School of Engineering. I lived in the dorms for a couple of years, joined engineering fraternities, and I found that my grades got better after I started socializing more because I could discuss things with other students, and work out mutual problems. Living on campus provided me with more opportunities to participate in social activities and to have better

access to the library and other facilities. The physical plant left a lot to be desired. I remember only one new building, Monroe Hall, that was built in the early 1950s. In 1956 Tompkins Hall was opened to provide classroom and laboratory space for the Engineering School. At that time it was quite a treat and we all put items in the cornerstone vault that is supposed to be opened in the year 2056. I was President of the joint chapter of the Institute of Radio Engineers and the American Institute of Electrical Engineers then (collectively that organization is now known as IEEE), and we were asked to gather items to put in the vault.

Bud: I can remember the first couple of weeks I enrolled in School of Engineering at the University of Maryland. At that time, one of the first things all engineering students did was to buy a slide rule. Although we never used many of the advanced scales on these slide rules, it was the mark of the engineer to have a slide rule hanging at your belt and slapping against your side as you went from class to class. It probably wasn't until the second year that you really got to do anything more than to multiply or divide with the thing. Remember that?

John: My daughter started engineering school five years ago, and I was asking a friend of mine, Professor Doug Jones, if it was still appropriate to give a student a slide rule, and he said, "No way, John, they probably wouldn't recognize a slide rule anymore." I went through engineering school with a five-inch slide rule, which was a lot easier to carry. My accuracy wasn't so good, however, it was usually adequate for my needs. I seldom needed any scales except for multiplication, division, square roots, and basic trigonometric fractions. Speaking of change, the calculators today have certainly provided a wonderful tool. You don't have to have mathematical know-how, just press the button marked tangent or cotangent and the answer appears right away.

Bud: The intrusion, if you will, of computers and calculators into our lives, is certainly one of the biggest changes I have seen. When I started out, even adding machines were hand cranked and very large in size, and the first electronic calculators that we bought for our business office, after I left school, were bigger than a typewriter and sold for at least $1500. Now you can buy for about $5 that same capability and it fits in your coat pocket and looks like a credit card.

John: We hardly had television when you and I were in engineering school. What do you think of the effect of all of the modern television on education training, besides providing jobs?

Bud: It certainly has had a big impact with the portable video cameras and the video tape recorders we are just beginning to use. The ability to do video tape experiments on a real-time basis is only one of an endless number of possibilities, such as computer-aided instruction. One concern is what may happen during power or device failures when the work still must be done. How do we manage to do some of the terribly complicated calculations and what happens to all our computers and our own memories. We still need to be able to go back to the basic formulas.

John: I deal with that by keeping an abacus in my office, and by the time I put the beads in the proper place I get my memory back. I do this at noon each day.

Bud: I still use my fingers and toes to add and subtract. While it is important to do calculations quickly and accurately, it is most important to understand the basic theories and to be able to obtain good approximate answers. I keep realizing more and more that the important things I got out of school was not the nitty, gritty technical aspects of engineering, but an understanding of the so-called "engineering approach" or "engineering method." With an understanding of the engineering approach, you can accept changes and work with them, because you know the bases for the changes.

John: Speaking of change, here's a quote from a newspaper article. "The most pathetic being is a changeless person in a changing world." I guess there really is a lot of truth in that. The article goes on to say, "Nothing in life is permanent but change--a basic truth with which most of us agree--but so basic that many people fail to apply it in their daily living, although they may acknowledge it in principle."

Bud: Yes, in thinking about that I become really impressed with the amount of change that has taken place in our own careers, the curriculum that is being taught, the facilities, and the professors that are presently there contrasted with the ones that were there.

John: Look at the specialization we have now. When we were in school, Bud, employers would hire electrical engineers, mechanical engineers, civil engineers, or chemical engineers, that was about it. Now we know that they not only look for an electronic engineer with recording experience but one in a certain type of medium, or they may look for a civil engineer that has a background in hydraulics with water density greater than 1.1. I think the effect of this is to broaden the whole scope of education, but at the same time, it narrows it for each individual. We are so specialized now that most tasks are multi-disciplined and, in order to get all the inputs to a particular task, many disciplines or specialties are needed. I know we mentioned computers a little earlier and I never thought they would get much beyond the realm of the electrical engineers but I see the school is very active in making them available to everyone in SEAS. We have seen some very fine examples of this at Engineers' Week and some of the things the school has put on for the alumni.

Bud: I think there is danger with all the specialization. Times are

changing and will continue to change. If a younger engineer chooses to emphasize only one subspecialty, that subspecialty may become obsolete, leaving him with no economically useful skills. The aeronautics and space fields are examples of this. We receive phone calls from people from around the country who may have 20 years experience in such a specific and narrow range that their ability to shift is very limited.

John: What you are saying I have seen happen many times. I worked for the space agency in Massachusetts, a very active engineering area. Those engineers that did not continue in graduate work, participate in professional meetings, or have a very active program of reading or studying, would often drop by the wayside. If, for example, you are working on a classified project that prohibits your discussing it with outsiders, then it becomes even more important to get back to school.

Bud: One approach to keeping your knowledge current is to take continuing engineering education courses. Many special fields becloud their knowledge with exotic terms, although the basic concepts are rather simple. However, the use of special terms makes it difficult for the layman or even the educated engineer to penetrate and learn about a field. That unfortunately is the way the world is and there is no question we are seeing it even in the construction business. We are exposed to increasing design complications, including for example, the design of computer facilities with backup uninterruptable power supplies and with the entire installation shielded from the effects of nuclear blasts.

John: I think our society has created a lot of problems that only an engineer can or will solve. I'm quoting from an article here which states, "Today, we live in a throw-away world, a world full of disposable products which has helped to create a throw-away mentality." As a result we are plagued by how to get rid of all our waste, what do you do with all the sludge at Blue Plains, etc. We all, however, are responsible for generating it. How do we get rid of beverage containers, the trash and this sort of thing that we come to take for granted as a part of our throw-away world.

Bud: We will drown in our own waste if we are not careful.

John: I think one of the greatest impacts that we see right now is the microprocessor chip. I think we will see a chip involved in a small power supply or anything we work with. We see it now in wrist watches, in automobiles and I'm sure shortly it will be in our lawn mowers. It is a fascinating device with its ability to control, miniaturize, and operate a whole range of devices.

Bud: We see it in our own design industry with ultimately the replacement of a draftsperson with a computerized drafting machine. We are a little ways away from that in the mechanical and electrical design, but it is only a matter of four to five years. A whole different breed of persons will be doing design as the engineer himself will be producing his own drawings but he will be a different kind of engineer with a different kind of background than I have. So that's the kind of change facing my profession and I have to grow with it and become computer educated.

John: I would like to say something about communications. When we were in engineering school, our principal form of communications was the telephone. Occasionally we may have sent a telegram, but it was limited, and I think within a very short period of time it will be very common for you and I to communicate with each other directly no matter where we are - whether it is by cellular telephones in our cars, or out on the bay catching some blues, or on a space ship on the way to our new docking port in space.

Bud: I think there is no question that we are going to see the video phone too, that knowledge is already available. You are going to send the documents that you are holding in your hand to me instantly, we can both look at it together and discuss it face-to-face, although we may be a thousand miles apart.

John: I appreciate and enjoy seeing the number of women in engineering. I think for some reason there were not many women that chose engineering as a career when we were in school, although there were two women in my engineering class. Now the numbers are much greater and I enjoy seeing the contribution they make. Also, the students at the Engineering School were mostly American born, although there were a few foreign students. They were usually from the families of diplomatic people in the United States and you didn't see foreign students coming to Washington to get an education at the universities that you see now.

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GW ENGINEERING NOW & NEXT

By Ingeresa Pincus

Ingeresa Pincus is a senior majoring in Mechanical Engineering. She has spent four years at GW, has participated in the co-op program, and is a member of Tau Beta Pi and Pi Tau Sigma honor societies.

GWU's location in the heart of D.C. makes it an exciting place to live, and is one of the attracting features of the university. Students here have the opportunity to visit the best museums in the country, enjoy great entertainment, experience Washington's many night spots, and become involved in the political scene.

Besides being a center for politics, the Washington D.C. area has developed into a "high tech" area. A wide range of opportunities for all types of engineers and computer scientists are available either with private companies or government research laboratories. I feel that engineering students can benefit from this abundance of engineering technology in several ways. The co-op program, which gives the student an opportunity to alternate between a semester at school and a semester working in an engineering organization, is growing into a strong program. I participated in the program myself and feel that it is an excellent way to get a better understanding of what engineering is all about. It provides a learning experience which is unattainable in the classroom. Because GW is well known in the area, co-op positions are often arranged with nearby organizations and part-time jobs can also be found.

The engineering faculty is a combination of full-time and part-time professors. My experience with part-time professors has been generally good. Part-time faculty may be less available to the students because they are full-time engineers, but most are teaching because they enjoy it. They often serve as a link between the university and the engineering community, keeping students abreast of current developments in engineering. The mechanical engineering department, in which I am enrolled, is small enough to enable students to get to know each other and the faculty. I have come to know several of my professors and have found them very willing to offer assistance. They may be busy but usually do not mind spending time with a student who needs help. This department is currently shifting into a new curriculum which is more computer oriented. In previous curricula the mechanical engineering students had little exposure to computer programming and computer applications related to their field. With the growing use and reliance on computers these days, I think this new focus is a step in the right direction in preparing students for work after graduation.

As for the student body, the engineering school must have a representative from almost every country in the world. Some American students are quite surprised when they first come to GW and have a difficult time adjusting to a minority status. Personally, I feel fortunate to have this unique opportunity to meet people from so many different countries and learn about other cultures. I have many good friends from all over and now want to visit many far away places. Although greatly outnumbered as a female in the engineering field, I have seen the number of women in GW's engineering school increasing every year. I have received much encouragement from faculty members and know that the male students quite like having the variety among classmates. The engineering field seems to be very receptive towards women at the present time, so I look forward to many opportunities.

There is, of course, room for improvement at GW, and ways to strengthen the engineering programs. For instance, the machine shop in Tompkins Hall which supports research work, the Minibaja effort, and students to some degree, could use some updating and improvement. With better equipped research laboratories and more technical support, I think the engineering school could attract more research contracts, bringing more funding as well as recognition to the school. An expansion in the research area would also increase the number of available part-time jobs for students interested in gaining practical work experience. Considering the school's location within a high tech area, there are opportunities for growth and improvement as long as contact is maintained with the professional engineering world. I feel that these connections are very important and would like to see special programs developed with some of the local area engineering

Continued on page 32

THE VAULT FOR THE FUTURE

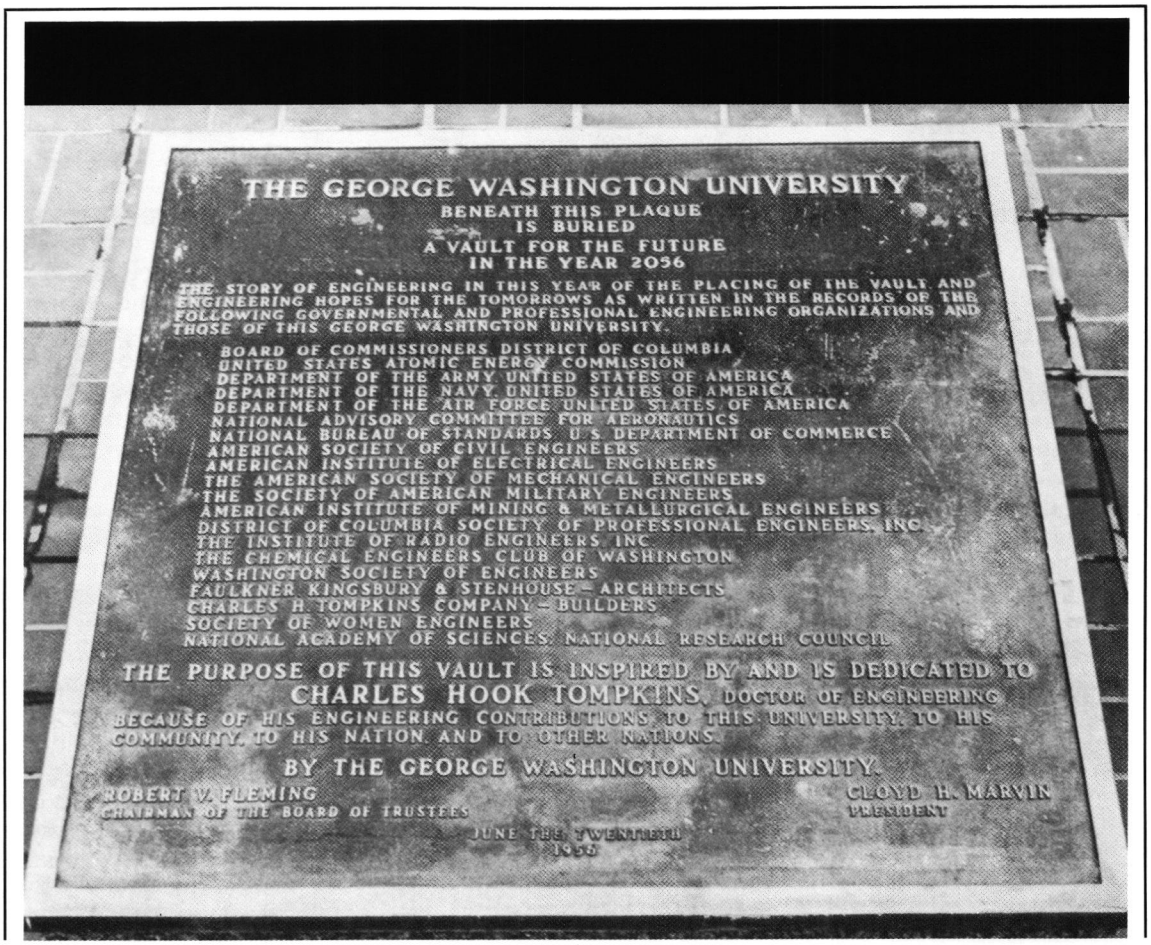
By Mary O. Jones

How many of you have walked up the stairs of the front entrance of Tompkins Hall, looked at that familiar plaque and wondered what lies in the "Vault for the Future"? Luckily Bill Ellenberger (BEE 1930, BME 1934) provided part of the answer to this question when he donated to the archives of the Engineer Alumni Association his file on the Vault for the Future. Bill kept the file because he was Chairman of the Washington, D.C. Section of the American Institute of Electrical Engineers in 1955 when the AIEE was asked to contribute items to the Vault. Bill was also chairman of the special committee of the Washington Section of the AIEE charged with preparing the AIEE contribution, and he was the AIEE representative at the dedication ceremony. This article could not have been written without his files.

The plaque, mounted on a granite block placed over the Vault, is inscribed as shown below.

The Vault contains contributions from the 20 Government agencies and national and local societies whose names are on the plaque as well as materials demonstrating the University's activities in technological scholarship and research at that time. Each group participating in the ceremony placed selected materials in one of 24 copper boxes, 8"x123"x18", and the boxes were sealed. During the dedication ceremonies the boxes were placed in a cradle which when filled, was lowered into the Vault. The Vault was then sealed, and a granite block surmounted by the bronze plaque was placed on the walkway directly over the Vault. A half hour program about the Vault for the Future was telecast on WRC TV.

The boxes contain such diverse items as documents and photographs, research reports, strain gauges, fine ball bearings, gas turbine blades, a gyroscope, and ball point pens -- all contributing to the record of engineering and technology in the Nation's Capital in 1956. One of the boxes contained a Tinkertoy Radio of the type dropped behind the Iron Curtain to "assist America's crusade for truth." In addition, a bronze plaque identical to the one placed on the granite block was placed in the Vault along with a


THE GEORGE WASHINGTON UNIVERSITY
BENEATH THIS PLAQUE
IS BURIED
A VAULT FOR THE FUTURE
IN THE YEAR 2056
THE STORY OF ENGINEERING IN THIS YEAR OF THE PLACING OF THE VAULT AND ENGINEERING HOPES FOR THE TOMORROWS AS WRITTEN IN THE RECORDS OF THE FOLLOWING GOVERNMENTAL AND PROFESSIONAL ENGINEERING ORGANIZATIONS AND THOSE OF THIS GEORGE WASHINGTON UNIVERSITY.
BOARD OF COMMISSIONERS DISTRICT OF COLUMBIA
UNITED STATES ATOMIC ENERGY COMMISSION
DEPARTMENT OF THE ARMY UNITED STATES OF AMERICA
DEPARTMENT OF THE NAVY UNITED STATES OF AMERICA
DEPARTMENT OF THE AIR FORCE UNITED STATES OF AMERICA
NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS
NATIONAL BUREAU OF STANDARDS U.S. DEPARTMENT OF COMMERCE
AMERICAN SOCIETY OF CIVIL ENGINEERS
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
THE SOCIETY OF AMERICAN MILITARY ENGINEERS
AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS
DISTRICT OF COLUMBIA SOCIETY OF PROFESSIONAL ENGINEERS, INC.
THE INSTITUTE OF RADIO ENGINEERS, INC.
THE CHEMICAL ENGINEERS CLUB OF WASHINGTON
WASHINGTON SOCIETY OF ENGINEERS
FAULKNER, KINGSBURY & STENHOUSE – ARCHITECTS
CHARLES H. TOMPKINS COMPANY – BUILDERS
SOCIETY OF WOMEN ENGINEERS
NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL
THE PURPOSE OF THIS VAULT IS INSPIRED BY AND IS DEDICATED TO
CHARLES HOOK TOMPKINS, DOCTOR OF ENGINEERING
BECAUSE OF HIS ENGINEERING CONTRIBUTIONS TO THIS UNIVERSITY, TO HIS COMMUNITY, TO HIS NATION, AND TO OTHER NATIONS.
BY THE GEORGE WASHINGTON UNIVERSITY.
ROBERT V. FLEMING
CHAIRMAN OF THE BOARD OF TRUSTEES
CLOYD H. MARVIN
PRESIDENT
JUNE THE TWENTIETH
1956

film of the dedication ceremonies.

The box presented by the AIEE contained information on such topics as the electric light and power industry (PEPCO), electrical systems for modern buildings, electrification of a municipal water supply system, telephone communication (C&P Telephone Co.), telegraph communication (Western Union), computers (the University's Logistics Computer), illumination (a 60 watt incandescent lamp bulb), and electrical safety (National Electrical Code). Also included was information on the AIEE, including a letter from the president of the AIEE, M.D. Hooven, to the president of the AIEE in the year 2056. President Hooven showed insight of future trends by addressing the letter to "Dear Sir or Madam:" The following are excerpts from his letter:

"Many of us are concerned about the electrical engineer becoming a mere servant of a thinking machine which those who delight in pure fantasy assure us will do all the difficult intellectual labors of the future; however, the majority of us are quite sure that we are addressing you, our successors, as the continued Masters of the machine, asserting your intellectual control over the physical universe without too much fuss and furor."

"Please remember, however, when you read back into the history of the mid-century period, that in spite of wars, depressions, droughts, and floods, this generation of electrical engineers was blessed with a huge enjoyment of life with its tremendous intellectual opportunities and social and intellectual interchange."

Unfortunately, there will not likely be a president of the AIEE in the year 2056 since the AIEE and the Institute of Radio Engineers merged in 1961 to form the Institute of Electrical and Electronics Engineers.

Tompkins Hall was a gift to the University from Charles H. Tompkins (1883-1956), a Trustee and alumnus of the University, and his wife, Lida, who was an alumna of the University. As President of the Charles H. Tompkins Company, Mr. Tompkins directed construction of many structures in the National Capital Area and elsewhere, including several major dams in the United States and abroad. From 1935 to June 1956, when the Vault was dedicated, all buildings at the University were built under his supervision. These included Lisner Auditorium, the University Hospital and Cancer Clinic, the University Library (now Lisner Hall), Hall of Government, Strong Hall, and Monroe Hall. His company also built the U.S. Courthouse, the East and West Executive Offices of the White House, the Lincoln Memorial Reflecting Pool, and the National Guard Armory. His company also remodeled the farm of the late President Eisenhower.

Mary O. Jones received her Master of Science degree in Computer Science from GW in 1976. She is president of the Engineer Alumni Association and is employed by the U.S. Geological Survey.

Tompkins was active in business and civic organizations in the National Capital Area and was a life member of the American Society of Civil Engineers. He was also a member of numerous engineering and fraternal organizations.

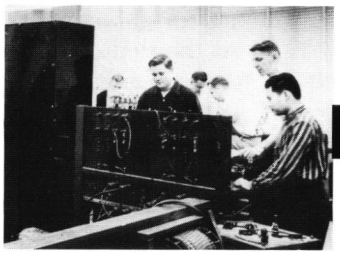
Charles H. Tompkins died December 12, 1956, less than six months after the dedication of the Vault for the Future. Tompkins Hall was opened for classes in the Fall of 1956. At the dedication ceremonies for the Vault for the Future, Mr. Tompkins said:

"It is not easy today for me to find words to adequately express my feelings. I confess to being human, and therefore influenced by emotional reactions from feelings of pride, gratitude and humility. Pride because of the recognition and honor that this convocation confers on me, and because of the implications of this occasion; gratitude for the opportunity to contribute something constructive for the benefit of the University and to the Engineering Profession, and for such a lasting recognition; feelings of humility because you, my friends, along with more worthy men, educators, and engineers are honoring me today.

"For 125 years, The George Washington University has been preparing young people to meet the challenges of a changing world, and during this time, under the leadership of such men as the Board Chairman, Robert V. Fleming, and President Cloyd Heck Marvin, this school has developed into one of the great educational institutions of our Nation. It would be interesting to be on hand when this Vault is unsealed -- to note the further progress of this University, as well as the progress made in those fields represented by the papers deposited in the Vault today.

"It has been my privilege for a number of years to serve as a Trustee of this University, and it has been a very satisfying experience. The University is honoring me today in appreciation of what they say I have done for the University. I, in turn, on behalf of people everywhere, express to The George Washington University our sincere thanks for its wonderful accomplishments, and its dedicated service to the young people of the world."

Now that you know more about the Vault, you will certainly want to be in front of Tompkins Hall on June 20, 2056, when the Vault is opened and its contents displayed.



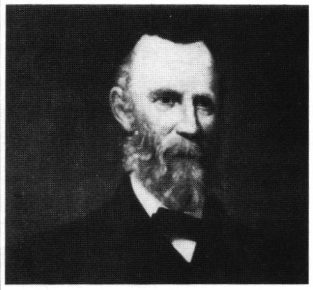
SEAS CELEBRATING ITS FIRST HUNDRED YEARS

by Nancy Reder

This sampling from the history of the School of Engineering and Applied Science is presented in celebration of its centennial, 1884-1984. The outline format of presentation offered here can only touch a few highlights; it gives just a hint of the rich history of GW's highly regarded engineering school. Nevertheless, we hope this retrospective look at SEAS will provide an interesting and useful overview of the school's first hundred years. Among sources used were GW bulletins, GW catalogs, Annual Reports and Mecheleciv, *the , magazine published by the Engineers' Council in cooperation with the Engineer Alumni Association.*

1884 One year of study costs $90.

Edward T. Fristoe is the first dean of the Scientific Faculty of the Corcoran Scientific School of the Columbian University, which is located in the University Building on the southeast corner of H and 15th Streets.



Dean Fristoe

The University Building

The Corcoran Scientific School catalog states, "The general courses embrace schemes of studies in literature, science and technology, leading collectively to the degrees of Bachelor of Science in civil... mechanical... [and] mining engineering."

126 students are enrolled in the fields of science and technology.

The Corcoran Scientific School catalog states: "To accommodate students... engaged in office work, the exercises [classes] of the School are held in the evening, from 6 to 10 o'clock..."

1887 Mechanical and topographical drawing are added to courses of instruction.

1889 The civil engineering branch of the Corcoran Scientific School offers: descriptive geometry; construction of buildings and machines and designing; surveying and field practice; mechanics; graphic statics, earthworks, roads and railroads, canals, rivers, and harbors; designing; strength of materials; engineering plant; masonry, bridges and tunnels, iron construction, building materials and metallurgy.

Dean Munroe

1892 Charles E. Munroe is dean of the faculty of the Corcoran Scientific School.

James C. Welling, president, The Columbian University, closes his annual report, "Thanks are especially due to Professor Charles E. Munroe, dean of the Corcoran Scientific School, for invaluable aid in organizing the graduate courses."

1895 Mrs. Henry Carter gives the university $5,000 to endow the first scholarship in civil engineering.

1897 Howard L. Hodgkins, Ph.D., professor of mathematics, becomes dean.

Dean Hodgkins

President B. L. Whitman's annual report beseeches the Corporation of the Columbian University to raise the salary of the dean to equal that of the dean of Columbian College on the basis of increased enrollment.

1898 The report of the dean of the Corcoran Scientific School to President B. L. Whitman reads in part, "While additions have been made in the equipment for electrical engineering... civil and mechanical engineering are urgent in asking an appropriation for a testing laboratory..."

1888-1900 35 degrees are conferred.

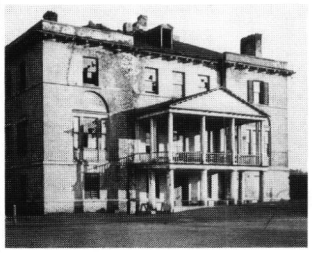
1903 The Corcoran Scientific School comes under the aegis of Columbian University Department of Arts and Sciences as the result of a merging of the Columbian College, the Corcoran Scientific School and the School of Graduate Studies.

1905 Administrative changes lead to initiation of the Washington College of Engineering, one of several semi-independent undergraduate colleges of the university. The Washington College provides instruction leading to undergraduate degrees in engineering and architecture. Classes are held in Van Ness House.

Mr. George Westinghouse donates electrical equipment to the Washington College of Engineering.

Washington College of Engineering becomes an approved technical school by the War Department. A degree therefrom leads to a position in the military without examination. The same privilege is shared by Worcester Polytechnic, Harvard University Engineering School and Lehigh University.

Washington College of Engineering has 135 students.



Van Ness House (pictured here during demolition)

1907 Two buildings on I Street, between 16th and Vermont Avenue, are rented to house Washington College of Engineering. Another building is supposed to house the mechanical lab.

1908 172 students are enrolled in Washington College of Engineering.

1910 President Stockton beseeches Board of Trustees to purchase or lease a building for a mechanical lab.

All university departments were located in these six buildings on Eye Street in 1912.

1912 The Department of Arts and Sciences, including the Washington College of Engineering, moves from I Street to G Street between 20th and 21st Streets.

1913 President Stockton's report to the Board of Trustees states, "Additional property was purchased and... the building of the [mechanical] lab begun, a special fund having been raised for the purpose through the efforts of General Maxwell Van Zandt Woodhull..."

1914 The mechanical lab is completed.

1917 Name is changed to the College of Engineering, offering "courses which are valuable for those entering several branches of the Naval Service."

1901-1920 201 degrees are conferred.

1921 Dean Hodgkins becomes president of the university. The College of Engineering is without a dean.

1923 Hugh Miller, C.E., serves as dean of the College of Engineering.

1926 Hugh Miller resigns as dean of College of Engineering.

1927 John Raymond Lapham, M.S. in C.E., becomes dean of the College of Engineering.

1928 Name is changed to the School of Engineering. Address is listed as Building 16, 714 20th Street. Mechanical engineering lab is at 2023 G Street in the rear of Lisner Hall.

1939 Civilian Pilot Training Program is established.

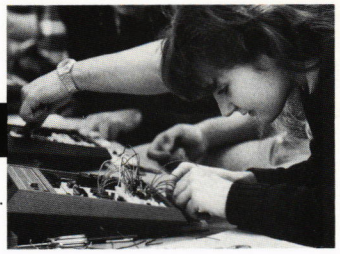
1940 Frederick Morris Feiker, B.S. in E.E., is named dean of the School of Engineering.

1921-1940 624 degrees are conferred.

1940-1945 School of Engineering offers War Training Courses for "Recent high school graduates, women, and older men... to fit them for more highly skilled jobs."

AS

SCHOOL OF ENGINEERING AND APPLIED SCIENCE



1942 Excerpt from October *Mecheleciv:* "We are in the midst of the biggest war mankind has ever known... We know the future rests on our shoulders... we must continue to go to school, even if to some, action on the battlefields seems more important... As long as we are granted the opportunity to go to school, it is the responsibility of every student to take the fullest advantage of it..."

1944 Excerpt from January *Mecheleciv:* "Much has been said in this column about the men in the Engineering School, and we feel that it's time to acknowledge some of the women in our midst..."

Excerpt from the Dean's Column in May *Mecheleciv:* "There remain in the faculty four full-time members... we have 85 to 90 part-time instructors... while the immediate future is confused by lack of consistent policy in Selective Service, the future of the School of Engineering, as a part of an enlarged George Washington University, is very real." (Feiker)

1947 Charles H. Tompkins donates $22,500 to GW School of Engineering to build a facility. Tompkins was an alumnus who started his own construction company (1922) and built many university buildings, including the hospital.

1949 The Office of Naval Research awards GW a logistics research contract to "study the possibilities of solving complex logistics problems."

The Navy Logistics Research Center, 1962

1941-1950 570 degrees are conferred.

1950 School of Engineering receives an additional $500,000 from Mr. and Mrs. Charles H. Tompkins for a new building.

1951 United States Air Force ROTC program at GW is approved.

Dean Feiker retires at age 70; he was dean for 13 years.

Dr. Martin Alexander Mason, B.S. in engineering from GW, 1931, assumes position of dean. Acceptance speech: "I hope to shape the School of Engineering to produce the highest quality professional men, by which I mean men who are first good citizens, and second, the best engineers."

1952 School of Engineering has over 2,300 alumni.

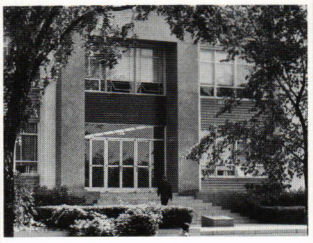
Howard Lecture Fund is established through gift from Trustee Frank A. Howard.

1953 President Marvin presents the recently remodeled Davis-Hodgkins House at 731 22nd Street to the engineering students to serve as a clubhouse and lounge.

1955 Tompkins Hall ground-breaking ceremony is held; 175 people are present.

1955 marks the establishment of the Engineering Administration Department.

1956 Tompkins Hall construction is completed. Vault for the Future is interred.



Tompkins Hall

1957 *Mecheleciv* article entitled, "A George Washington First": GW is the only school offering engineering undergraduates a models laboratory (which opened in the fall of 1957 in Tompkins Room 204) in conjunction with their structures courses.

April issue of *Mecheleciv* is devoted to women in engineering.

1962 The undergraduate degree program is redesigned into levels of advancement—Introductory, Intermediate and Advanced—without a set curriculum. Dean Mason explains his purpose thus: "...to restore the student to his proper place as the single most important element in the educational process..."

1963 Engineer Alumni Association is reestablished (1984 membership is approximately 6,400).

1968 School of Engineering and Applied Science has 32 full-time faculty members (about 72 percent of whom hold doctorates) and 38 part-time faculty members.

Dr. Harold Liebowitz, B.Ae.E., M.Ae.E and Ph.D. from the Polytechnic Institute of Brooklyn, is appointed dean of SEAS, which has total annual research support of about $170,000.

Dean Liebowitz

Dean Liebowitz is referred to in *Mecheleciv* as "a new dean of international stature who has committed himself to the task of transforming SEAS into a 'little M.I.T.' and then into a 'great SEAS'."

1969 Off-campus graduate programs begin. (Today these are conducted at some 20 locations. Enrollment has grown to more than 1,000 students in 1984.)

Computer engineering option is offered within the Department of Electrical Engineering. (Since then, eight other options have been added to the undergraduate curriculum.)

SEAS' division of Continuing Engineering Education is established, offering 15 courses to 170 students. (Today it is a worldwide program, offering nearly 600 courses in the United States and abroad to some 10,000 students.)

Institute of Fatigue and Structural Reliability is established.

1970 Excerpt from *Evening Star:* "The story of how he [Liebowitz] is harnessing the region's resources... makes dramatic reading... In an aura of total commitment from President Elliott through the student body, Liebowitz has been 'knocking on doors' seven days a week to perfect his program."

1970 marks the beginning of the Cooperative Education Program in Engineering, which formally integrates the students' academic study with work experience with participating employer-organizations. (The program in 1984 involves more than 80 students and more than 40 employers.)

1971 Department of Operations Research is established.

NASA Langley Research Center joins with SEAS to create the Joint Institute for Advancement of Flight Sciences, dedicated to increasing the nation's research and engineering capabilities. SEAS today has six additional institutes, for research in the areas of fatigue and fracture mechanics, management science, reliability and risk analysis, water resources, information science, and artificial intelligence.

1973 SEAS establishes a 3:2 dual-degree program in liberal arts/engineering in cooperation with other 4-year accredited institutions. To date this relation exists with 13 institutions.

1975 Dean Liebowitz is elected to National Academy of Engineering. Subsequently, two other faculty members also are elected: Alfred Freudenthal in 1976 and Maurice Abstein in 1977. In addition to these honors, a significant number of faculty have become fellows of professional societies.

1978 Engineering Honor Scholarship Program is established; half tuition for five years leading to a bachelor's degree with an option to continue for one year in a master's degree program. Other scholarship programs have been initiated as well, with Atlantic Research, National Bureau of Standards, Boeing and COMSAT, among others.

Honors Research Program is established to enable undergraduates to participate in a variety of research projects and seminars.

1981 SEAS expands its computer facilities in Tompkins Hall and Staughton Hall.

To promote growing interaction between industry and the research and educational programs of SEAS, the Industrial Liaison Program is established with the Department of Electrical Engineering and Computer Science.

1982 Graduate Engineering Honors Fellowship Program is established.

Expanded Bachelor of Science degree programs are offered in civil, electrical, and mechanical engineering, and operations research and computational science.

SEAS expands its facilities by occupying space in the Academic Center, in addition to its quarters in Tompkins Hall, Staughton Hall and the Gelman Library.

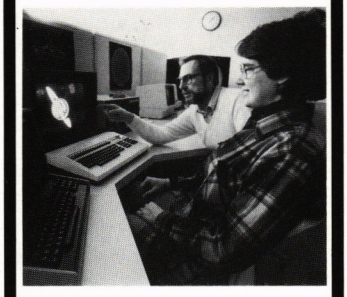
SEAS' sponsored reseach contracts build up to $7 million; 80 sponsored research projects are under way.

1983 SEAS is one of 20 university departments nationwide chosen by IBM to receive $2 million of computer equipment and software, including an IBM 4341 processor with 16 million characters of main storage, IBM direct access storage devices, IBM graphics terminals and software packages. Prior to SEAS' selection for this grant, the school was already developing programs in computer-aided design and computer-aided manufacturing (CAD/CAM).

Across the board laboratory expansion doubles SEAS' lab space and increases the investment in lab equipment to the present value of more than $5 million.

SEAS takes initiative in establishment of NROTC at GW.

SEAS graduates this year total 580 (undergraduate, master's, professional and doctoral degrees).



1984 Undergraduate enrollment is over 1,000, and graduate enrollment is approximately 2,500, of which about 1,000 are enrolled off-campus.

SEAS full-time faculty numbers about 75 (90 percent of whom hold doctorates); 301 part-time faculty members also are employed.

SEAS freshman students post highest average SAT scores at GW.

Total income for SEAS is over $25 million.

All SEAS undergraduate programs (civil, mechanical, electrical engineering, computer science, and systems analysis and engineering) are accredited or reaccredited by the Accreditation Board for Engineering and Technology. In addition, today SEAS offers more than 40 graduate degree programs. □

Nancy Reder is a newswriter for GW's Office of News and Public Affairs.

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From the EAA President

Welcome to the second joint EAA/Engineers' Council issue of MECHELECIV. In this issue we are celebrating the 100-year anniversary of the School of Engineering and Applied Science. If only those first GW engineering students could see the labs and computers our SEAS students are using today. They would be befuddled and amazed at the technology. After all, those early GW students did not even have cars, let alone computers! On the other hand, today's students would find a trip back to the GW of 1884 quite educational. They, as most of us, take for granted things that the early students never dreamed were possible. Just imagine what 100 more years will bring us!

I wish to apologize to two past presidents of the EAA who were inadvertently omitted from the active roster of Board members that was included in the last issue of MECHELECIV - John Manning and Dick Pronk. Both have contributed many hours of their time to the EAA, and John is now serving a two-year term as president of the General Alumni Association.

We are continuing to make plans for EAA events for the spring semester - a "back to school" function, an embassy reception, the Dean's Reception, and Reunion weekend. Details will be available in future issues of MECHELECIV.

Mary O. Jones,
President, EAA

ENGINEER ALUMNI ASSOCIATION

COMMITTEE ASSIGNMENTS 1984-85

EXECUTIVE COMMITTEE:
Mary Jones*,
Dudley Schwartz, Bob Dickey,
Nahid Khozeimeh, Ron Howard

FINANCE COMMITTEE:
Bob Dickey*, Nahid Khozeimeh,
Diego Roque

BYLAWS COMMITTEE:
Wes Harris*

ADMISSIONS COMMITTEE:
Cleve Watkins*

ALUMNI AWARDS COMMITTEE:
Doug Jones*, Issa Khozeimeh,
John Manning, Pastor Farinas

PUBLICITY COMMITTEE:
Dave Johnson*, Cleve Watkins,
Ayman Jumean

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Advisory Board Representative:
Issa Khozeimeh
Contributing Editor:
Mary O. Jones
Advertising Coordinator:
Dudley Schwartz

NOMINATING COMMITTEE:
Issa Khozeimeh*, Dick Pronk

PROGRAM COMMITTEE:
An Le*
Picnic: An Le*, Ayman Jumean
Lecture: Diego Roque*,
Frank Atwood, John Manning
Cultural Event:
Nahid Khozeimeh*
Dean's Reception: Bob Dickey*
School Function: Dick Hu*,
Ed Stengard

SCHOLARSHIP COMMITTEE:
Diego Roque*
Selection: Doug Jones*, Dick Hu
Finance: Diego Roque*,
Dudley Schwartz

AD HOC COMMITTEES:
Audit: Eric Mendelsohn*,
Pator Farinas
SEAS Centennial:
Nahid Khozeimeh*
Phonathon: Eric Mendelsohn*,
Ayman Jumean
Engineers Week: An Le*,
Mike Hubbard
Reunion Weekend: An Le*,
Ayman Jumean, Ed Stengard
EAA Directory:
Jim Sinsabaugh*,
Issa Khozeimeh

*Denotes committee chairman

Engineer Alumni Association Tentative Schedule of Upcoming Events

March — Dean's Reception
April — "Back to School" Function (reception and tour of SEAS CAD/CAM computer facility)
May or June — Embassy Reception
June 8th — Reunion Weekend
Details will be provided in upcoming issues of MECHELECIV.

A letter from the Council President:

The Engineers' Council has been busy with planning activities for the near future and completing some leftover jobs.

The face-lift for D-H House is finally completed. The green paint has been stripped and the original red brick has been filled in and renovated. The windows and the doors have been repainted. All these improvements have given the house a newer and a cleaner look. The best part is the fact that the renovations did not cost the Council anything, because the physical plant and the School of Engineering covered the costs.

The Council and the Engineer Alumni Association held their Annual Engineering School Picnic on Saturday September 29th. In spite of overcast weather it was well attended. The rain held off but the spirits did not. The alumni managed to field an excellent volleyball team which beat all competition. Everybody that showed up had a good time — including Dean Liebowitz. The Dean is to be commended on his support of student activities with the hope that such support shall continue.

The Council is in the process of recreating an exam file for all students. If there are any freshman or sophomores interested in helping in setting up the test file please contact the Engineers' Council. The Sophomores and freshmen will get the most benefit from this because they will be here the longest. But we ask all the students to help by bringing the old exams for us to photocopy and keep on file. The exam file is not restricted to courses taught by the School of Engineering and Applied Science, but includes non-SEAS courses that a SEAS student is likely to take in his curriculum. These might include math, physics, chemistry and other subjects. Please take the time to drop these tests by D-H House.

The Council has just purchased a new copier. This copier was needed as the old one became obsolete. The new copier will allow reduction and enlargements and will also allow photocopies to be made on labels or clear plastic sheets. The Council is also selling double sided double density diskettes for $3.00 each. This action was taken because of the outrageous prices of diskettes at different places on campus. We are able to buy them in bulk and therefore pass the savings on to the students.

The Council is looking into a new idea of trying to get some computer companies around the Washington area to offer a special rate for students of GW. Some stores have shown some interest in the idea but the final details have not been worked out as of yet. The amount of discount and other details have yet to be finalized. For more information about this deal come by and ask me about it.

Finally the Council needs the help of students. There are now vacant seats on the Council due to some resignations. If you are interested in helping, please contact me at 676-6744.

Ayman Jumean,
President, Engineers' Council

Engineers' Council Meeting

Reprinted November 1953 issue of MECHELECIV — Some Things Never Change

ABOUT THE "CAMPUS NEWS" PAGE: The purpose of providing this space for campus news is to inform the Engineering School community of interesting events and activities. Such news may include (but is not restricted to) information about professional and honor societies; research and other academic activities, important administrative and academic decisions and policies, faculty spotlights; research and teaching fellowships, and other financial support information for students; "calls for participation" in informal research groups, sponsored research, and social events; and so on.

In order to enhance the gathering and inclusion of such information, the following faculty have volunteered to serve as their department's liaisons to MECHELECIV:

Professor Walter Kahn
EE/CS
Acad. Cen. T643
676-7186

Professor Douglas Jones
CMEE
Acad. Cen. T702
676-6929

Professor Presson Shane
EAD
Gelman Lib. 633
676-7153

Professor Donald Gross
OR
Tomp. Hall 101
676-6084

Though MECHELECIV will make every effort to report on any interesting activity, any individual, group or department interested in publicizing any news, activity or decision, is encouraged to take the initiative and provide such information to MECHELECIV by either contacting one of the faculty listed above, or by directly contacting MECHELECIV at 676-3998. Information or material may also be either mailed or delivered to the MECHELECIV office at Room 203, Davis-Hodgkins House, 2142 G Street, N.W. Washington, D.C. 20037. With any material that is submitted, please include the name of a "contact person" and a telephone number or address where the contact person can be reached. MECHELECIV reserves the right to edit or omit any material that is submitted.

Department of Civil, Mechanical and Environmental Engineering (CMEE)

Degree programs in civil and mechanical engineering are combined into one department because of the many subjects of common interest.

Civil Engineering

Civil engineering is the oldest engineering profession, whose objective is to provide a clean, safe and comfortable environment in which society lives and works. The two major areas of emphasis in the civil engineering curriculum are structured analysis and design, and environmental engineering, including water resources and treatment.

Mechanical Engineering

Of all the engineering disciplines, mechanical engineering encompasses the greatest diversity of subject matter. These include the design and production of a wide variety of devices, machines, and systems for energy conversion, environmental control, materials, processing transportation, materials handling, and many other purposes. The two major areas of emphasis in the mechanical engineering curriculum are the development and efficient utilization of energy and the design of structures and motion in engineering systems. A majority of all applications of computer-aided design (CAD) are in the mechanical engineering area and along with computer-aided manufacturing (CAM) are being accorded increasing emphasis in the mechanical engineering curriculum.

Research Activities

Although all of the faculty members in the CMEE Department are involved in research, some of this work involves research groups of varying size and activity levels. Areas of active research on campus include:

Automated manufacturing processes
Combustion diagnostics
Constitutive theory development
Energy
Fracture mechanics and fatigue
Propulsion
Structural dynamics and reliability
Structural engineering
Thin-film surface deposition
Water resources
Waste water treatment

Brief summaries of research activities in constitutive theory development and energy are included below. Discussions of other research activities will be included in later issues of MECHELECIV.

CONSTITUTIVE THEORY DEVELOPMENT

Professor J. Eftis 676-6536
Professor D.L. Jones 676-6929

A great deal of interest has recently developed for improving procedures for modelling the time-dependent (inelastic) response of materials subjected to static or cyclic applied loads. Improvements in materials testing equipment and methods have led to more comprehensive testing and evaluation procedures than were possible only 20 years ago. Also, the development and application of sophisticated constitutive models (which require

extensive computational capabilities) has been enhanced considerably by recent increases in computer power.

Facilities for both computational and research in this area are available here. In this research program, these facilities and others elsewhere, are used in the development and evaluation of constitutive models. The production of master's theses and doctoral dissertations is supported by this research, with these students presently pursuing dissertation research. Research group meetings are held on a regular basis, and are open to interested students.

ENERGY

Professor A. B. Cambel 676-7135

The graduate energy programs of the CMEE Department offer a wide variety of courses and undertake diverse areas of research. Because energy matters comprise an understanding of various disciplines including the physical sciences, engineering, mathematics and economics, the course program is multidisciplinary in order to enable the graduate student to deal with task/mission oriented problems and issues in an interdisciplinary manner.

In each degree (MS, Ap.Sc., P.E., DSc) two options are offered: Energy Technology and Energy Systems. The former is targeted for design and synthesis, while the latter may be better suited for those interested in energy program planning.

Weekly seminars are held throughout the academic year where students hear prominent outside speakers or present their thesis (MS) or dissertation (DSc) research for constructive criticisms.

To further enhance communications among the members of the Energy Research Group, a computerized electronic board system has been initiated and is being developed continuously.

Department of Operations Research (OR)

Undergraduate Program in Systems Analysis and Engineering

The department of Operations Research offers a Bachelor of Science degree program in Systems Analysis and Engineering. This program was fully accredited by ABET on their visit to the School last November. The program is only five years old and was formerly called Operations Research and Computational Science.

Systems Analysis and Engineering is the application of scientific methods and engineering techniques to the solution of management problems, especially when the most efficient and effective use of resources is concerned. Its practitioners seek to observe, understand, and predict the behavior of man-machine systems so that the best decisions about these systems can be made.

Applications of Systems Analysis and Engineering are found almost everywhere: in the single waiting line now used at most banks and post offices; in the traffic signal synchronization that improves overall traffic flow; in the delivery and pick-up routes and schedules of food distributors, delivery services, and garbage collection operators. Other applications include the choice of first station locations; the coordination and task, scheduling for large construction projects; production-line scheduling for manufactured items such as automobiles and appliances; determination of spare parts needs for the automobile industry and for individual dealers; and the calculation of "fair" multiple-shift work schedules for airline crews, nurses, police officers, and emergency service personnel.

Systems Analysis and Engineering, as an applied scientific discipline, has a body of specialized methods that are used to design, analyze, and improve operations and management systems. It is actually an interdisciplinary field — a synthesis of many disciplines that has evolved into an exciting field of its own. It combines many of the techniques and theories of engineering, mathematics, computer science, statistics, management, and economics.

Technical electives are "tracked," that is, the student must choose an area of concentration (a minor, so to speak) in one of the following areas:

Computer Systems
Control and Instrumentation Systems
Electrical Energy Systems
Electro-mechanical Systems
Environmental Systems
Financial Systems
Management Decision Systems
Mathematical Systems
Mechanical Energy Systems
Naval Systems
Network Systems
Production Systems
Statistical Systems

Because a great range of applications and many varied scientific techniques combine to make up the multidisciplinary approach of Systems Analysis and Engineering, the profession is a dynamic and vital one. Systems Analysis and Engineering should be seriously considered by anyone attracted to the use of computers, mathematics, statistics, engineering, and other sciences in finding solutions to decision problems with practical impact.

Department of Engineering Administration (EAD)

The 686 engineering administration students enrolled at present

(366 on campus and 320 off campus) will be the last to complete the program with three core courses. The faculty added a fourth core course at its planning retreat at Airlie last October. This fourth core course is to provide hands-on computer experience and to make extensive use of accounting and finance in the subject matter of the course. The dual objectives of the new core course are to provide, early in the program of study, basic skills with computers, and knowledge of finance/accounting. Feedback from alumni and faculty commitment to keep the George Washington program in its historic leadership role were instrumental in this development.

Engineering administration alumni are reminded that George Washington University graduates may audit University courses on a space available basis, for a modest fee. Some of the courses that have been added to the curriculum and that are to be added may be of interest to alumni. A listing of current courses may be obtained from Chairman Robert C. Waters in Gelman 624 or by calling (202) 676-7409.

HONOR SOCIETIES

ETA KAPPA NU - Electrical Engineering Honor Society

Physicists and electrical engineers derived the words "electron" and "electronic" from the Greek name for amber: HΛEKTPON. Five electrical engineering students of the University of Illinois, in 1904, used the first, the fourth and the last letters of this Greek word for their society HKN - Eta Kappa Nu. The organization has developed into the International Honor Society for Electrical Engineers. Through the years, Eta Kappa Nu has gained recognition and respect from university administrators, scholars, professionals and employers. Eta branches and chapters have been established at approximately 200 locations in the United States, Europe, and Asia.

The GW chapter of Eta Kappa Nu was established in 1979. Since then, over 100 students have been initiated and become members. Primarily, EE/CS undergraduates in the upper fourth of their junior year or upper third of their senior year, scholastically, are invited to join. However, the possession of exemplary character and the willingness to serve will also be taken into consideration. Furthermore, graduate students, members of the instructional staff and electrical engineers with marked ability, meritorious work and distinguished accomplishment are also eligible.

This semester, Professor Robert Harrington together with two graduate students and fourteen undergraduates were elected and then inducted on November 17, 1984. Anyone who thinks himself/herself eligible and is interested in joining, please leave a note in the Eta Kappa Nu mailbox in Tompkins Hall, Room 103.

Now & Next

Continued from page 23

organizations. The purpose of these programs would be to enable students to have more exposure to technical advances in their field and gain practical experience to complement their studies. For example, the programs could include organized lecture series, field trips and short internships.

I can honestly say that my four years at GW have been well spent. I feel that I've received a solid academic background in engineering and am now ready to put into practice what I have learned. I am grateful to several faculty members who have helped give me the opportunity to gain work experience during my school years. Hopefully GW will continue to grow and improve, bringing more recognition and support for the engineering school in the future.

POSITIONS AVAILABLE

MECHELECIV is seeking to fill the following positions:

Immediate Openings

1. Advertising Department:
A number of talented people are needed to solicit advertisements for the magazine and manage related public relationing responsibilities. **Compensation** includes commission on advertisements solicited. Flexible working schedule.
2. Other Positions:
MECHELECIV is looking for **Artists, Writers,** and **Photographers.**

Editorial Board Positions for 1985-1986

MECHELECIV is now soliciting applications for various Editorial Board positions for next year.

Though persons not affiliated with GW will be considered, preference will be given to members of GW community.
For more information, please write to MECHELECIV (address on inside back cover) or call 676-3998.

Telecommunications

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FOR YOUR INFORMATION

MECHELECIV encourages all students, alumni, faculty and staff of the School, and our other readers to contribute to or join the magazine and avail of this unique opportunity for organizational, journalistic and artistic experience, as well as receive exposure and recognition.
For more information, please call (202) 676-3998 or write to MECHELECIV.

SUBSCRIPTIONS AND CONTRIBUTIONS

MECHELECIV is distributed to all Engineering School students as a service provided by the Engineers' Council. Alumni of the School receive MECHELECIV by funding provided by the Engineer Alumni Association (EAA). Alumni are urged to contribute to MECHELECIV in order to sustain EAA funding for the magazine and hence preserve this forum of exceptional service to the Engineering School community.

Payments may be made out by cheque or money order to "MECHELECIV, GWU" and addressed to:

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